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Protection of Environment

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PARTS 53 TO 80

Revised as of July 1, 1982

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code of federal regulations

Protection of Environment

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PARTS 53 TO 80

Revised as of July 1, 1982

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I

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U.S. GOVERNMENT PRINTING OFFICE
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Cite this Code **CFR**

thus: **40 CFR 53.1**

Explanation

The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. The Code is divided into 50 titles which represent broad areas subject to Federal regulation. Each title is divided into chapters which usually bear the name of the issuing agency. Each chapter is further subdivided into parts covering specific regulatory areas.

ISSUE DATES

Each volume of the Code is revised at least once each calendar year and issued on a quarterly basis approximately as follows:

Title 1 through Title 16..... as of January 1
Title 17 through Title 27..... as of April 1
Title 28 through Title 41..... as of July 1
Title 42 through Title 50..... as of October 1

The appropriate revision date is printed on the cover of each volume.

LEGAL STATUS

The contents of the Federal Register are required to be judicially noticed (44 U.S.C. 1507). The Code of Federal Regulations is prima facie evidence of the text of the original documents (44 U.S.C. 1510).

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The Code of Federal Regulations is kept up to date by the individual issues of the Federal Register. These two publications must be used together to determine the latest version of any given rule.

To determine whether a Code volume has been amended since its revision date (in this case, July 1, 1982), consult the "List of CFR Sections Affected (LSA)," which is issued monthly, and the "Cumulative List of Parts Affected," which appears in the Reader Aids section of the daily Federal Register. These two lists will identify the Federal Register page number of the latest amendment of any given rule.

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Each volume of the Code contains amendments published in the Federal Register since the last revision of that volume of the Code. Source citations for the regulations are referred to by volume number and page number of the Federal Register and date of publication. Publication dates and effective dates are usually not the same and care must be exercised by the user in determining the actual effective date. In instances where the effective date is beyond the cut-off date for the Code a note has been inserted to reflect the future effective date. In those instances where a regulation published in the Federal Register states a

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date certain for expiration, an appropriate note will be inserted following the text.

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The Paperwork Reduction Act of 1980 (Pub. L. 96-511) requires Federal agencies to take steps to reduce the Federal paperwork burden for individuals, small businesses and State and local governments, as well as to maximize the usefulness of information collection. One specific requirement of the Act is for Federal agencies to display an OMB control number with the information collection request.

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Provisions that become obsolete before the revision date stated on the cover of each volume are not carried. Code users may find the text of provisions in effect on a given date in the past by using the appropriate numerical list of sections affected. For the period before January 1, 1973, consult either the List of CFR Sections Affected, 1949-1963, or 1964-1972, published in three separate volumes. For the period beginning January 1, 1973, a "List of CFR Sections Affected" is published at the end of each CFR volume.

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What is incorporation by reference? Incorporation by reference was established by statute and allows Federal agencies to meet the requirement to publish regulations in the Federal Register by referring to materials already published elsewhere. For an incorporation to be valid, the Director of the Federal Register must approve it. The legal effect of incorporation by reference is that the material is treated as if it were published in full in the Federal Register (5 U.S.C. 552(a)). This material, like any other properly issued regulation, has the force of law.

What is a proper incorporation by reference? The Director of the Federal Register will approve an incorporation by reference only when the requirements of 1 CFR Part 51 are met. Some of the elements on which approval is based are:

(a) The incorporation will substantially reduce the volume of material published in the Federal Register.

(b) The matter incorporated is in fact available to the extent necessary to afford fairness and uniformity in the administrative process.

(c) The incorporating document is drafted and submitted for publication in accordance with 1 CFR 51.4.

Properly approved incorporations by reference in this volume are listed in the Finding Aids at the end of this volume.

What if the material incorporated by reference cannot be found? If you have any problem locating or obtaining a copy of material listed in the Finding Aids of this volume as an approved incorporation by reference, please contact the agency that issued the regulation containing that incorporation. If, after contacting the agency, you find the material is not available, please notify the Director of the Federal Register, National Archives and Records Service, Washington DC 20408, or call (202) 523-4534.

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A subject index to the Code of Federal Regulations is contained in a separate volume, revised annually as of January 1, entitled CFR INDEX AND FINDING AIDS. This volume contains the Parallel Table of Statutory Authorities and Agency Rules (Table I), and Acts Requiring Publication in the Federal Register (Table III). A list of CFR Titles, Chapters, and Parts and an alphabetical list of agencies publishing in the CFR are also included in this volume.

An index to the text of Presidential documents appears at the end of each compilation of Title 3, The President.

The Federal Register Index is issued monthly in cumulative form. This index is based on a consolidation of the "Contents" entries in the daily Federal Register.

A List of CFR Sections Affected (LSA) is published monthly, keyed to the revision dates of the 50 CFR titles.

INQUIRIES AND SALES

For a summary, legal interpretation, or other explanation of any regulation in this volume, contact the issuing agency. Inquiries concerning editing procedures and reference assistance with respect to the Code of Federal Regulations may be addressed to the Director, Office of the Federal Register, National Archives and Records Service, General Services Administration, Washington, D.C. 20408 (telephone 202-523-3517). Sales are handled exclusively by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

JOHN E. BYRNE,
Director,
Office of the Federal Register.

July 1, 1982.

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THIS TITLE

Title 40—PROTECTION OF ENVIRONMENT is composed of nine volumes. The parts in these volumes are arranged in the following order: Parts 0-51, Part 52, Parts 53-80, Parts 81-99, Parts 100-399, Parts 400-424, and Part 425 to end. The contents of these volumes represent all current regulations codified under this title of the CFR as of July 1, 1982.

Chapter I—Environmental Protection Agency appears in all seven volumes. A Pesticide Tolerance Commodity Index appears in Parts 150-189. Regulations issued by the Council on Environmental Quality appear in the volume containing Part 425 to end.

For this volume, Linda A. Rice-Johnston was Chief Editor, assisted by Donna L. Rickett, and Beth R. Carter. The Code of Federal Regulations publication program is under the direction of Martha B. Girard, assisted by Robert E. Jordan.

Title 40—Protection of Environment

(This book contains Parts 53-80)

Part

CHAPTER I—Environmental Protection Agency (Continued). 53

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CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

(Parts 53-80)

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EDITORIAL NOTE: Subchapter C—Air Programs is continued from the two volumes containing 40 CFR Parts 0-51, and 40 CFR Part 52.

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PART 53—AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS

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53.3 General requirements for an equivalent method determination.
53.4 Applications for reference or equivalent method determinations.
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APPENDIX A—OPTIONAL FORM FOR REPORTING TEST RESULTS

AUTHORITY: Sec. 301(a) of the Clean Air Act (42 U.S.C. sec. 1857g(a)), as amended by sec. 15(c)(2) of Pub. L. 91-604, 84 Stat. 1713, unless otherwise noted.

SOURCE: 40 FR 7049, Feb. 18, 1975, unless otherwise noted.

Subpart A—General Provisions

§ 53.1 Definitions.

(a) Terms used but not defined in this part shall have the meaning given them by the Act.

(b) "Act" means the Clean Air Act (42 U.S.C. 1857-1857*l*), as amended.

(c) "Agency" means the Environmental Protection Agency.

(d) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(e) "Reference method" means a method of sampling and analyzing the ambient air for an air pollutant that is specified as a reference method in an appendix to Part 50 of this chapter, or a method that has been designated as a reference method in accordance with this part; it does not include a method for which a reference method designation has been cancelled in accordance with § 53.11 or § 53.16.

(f) "Equivalent method" means a method of sampling and analyzing the ambient air for an air pollutant that has been designated as an equivalent method in accordance with this part; it does not include a method for which an equivalent method designation has been cancelled in accordance with § 53.11 or § 53.16.

(g) "Candidate method" means a method of sampling and analyzing the ambient air for an air pollutant for which an application for a reference method determination or an equivalent method determination is submitted in accordance with § 53.4, or a method tested at the initiative of the Administrator in accordance with § 53.7.

(h) "Manual method" means a method for measuring concentrations of an ambient air pollutant in which sample collection, analysis, or measurement, or some combination thereof, is performed manually.

(i) "Automated method" or "analyzer" means a method for measuring concentrations of an ambient air pollutant in which sample collection,

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analysis, and measurement are performed automatically.

(j) "Test analyzer" means an analyzer subjected to testing as a candidate method in accordance with Subpart B of this part, Subpart C of this part, or both.

(k) "Applicant" means a person who submits an application for a reference or equivalent method determination under § 53.4, or a person who assumes the rights and obligations of an applicant under § 53.7.

(l) "Ultimate purchaser" means the first person who purchases a reference method or an equivalent method for purposes other than resale.

[40 FR 7049, Feb. 18, 1975, as amended at 41 FR 11255, Mar. 17, 1976]

§ 53.2 General requirements for a reference method determination.

(a) *Manual methods.* Except as provided in § 53.16, manual methods will not be considered for reference method determinations under this part.

NOTE: As defined in § 53.1(e), "reference method" includes a manual method specified in an appendix to Part 50 of this chapter. Except as provided in § 53.16, the provisions of this part are inapplicable to such a method.

(b) *Automated methods.* A candidate automated method must utilize the measurement principle and calibration procedures specified in the appropriate appendix to Part 50 of this chapter and meet the requirements specified in Subpart B of this part.

NOTE: Except as provided in § 53.16, an automated method will not be considered for a reference method determination if a manual reference method is specified in the appropriate appendix to Part 50 of this chapter.

[41 FR 11255, Mar. 17, 1976]

§ 53.3 General requirements for an equivalent method determination.

(a) *Manual methods.* Candidate manual methods must satisfy the requirements specified in Subpart C of this part.

(b) *Automated methods.* Candidate automated methods must satisfy the requirements specified in Subparts B and C of this part.

§ 53.4 Applications for reference or equivalent method determinations.

(a) Applications for reference or equivalent method determinations shall be submitted in triplicate to:

Director, Quality Assurance & Environmental Monitoring Laboratory, Department E, United States Environmental Protection Agency, National Environmental Research Center, Research Triangle Park, North Carolina 27711.

(b) Each application shall be signed by an authorized representative of the applicant, shall be marked in accordance with § 53.15 (if applicable), and shall contain the following:

(1) A clear identification of the candidate method which will distinguish it from all other methods and by which it may be referred to unambiguously.

(2) A detailed description of the candidate method including but not limited to the following: The measurement principle, manufacturer, name, model number, and other forms of identification; a listing of the significant components; schematic diagrams; and a detailed description of the apparatus and measurement procedures.

(3) A copy of a comprehensive operation or instruction manual providing a complete and detailed description of the operational and calibration procedures prescribed for field use of the candidate method and all instruments utilized as part of that method. The manual shall include adequate warning of potential safety hazards that may result from normal use, or (if the method is automated) from normal use or malfunction, of the method and a description of necessary safety precautions (see § 53.9(b)). For automated methods, the manual shall include a clear description of installation and operation procedures and of necessary periodic maintenance, as well as comprehensive trouble-shooting and corrective maintenance procedures and parts identification diagrams.[1] The

[1] Guidance for the development of such a manual may be found in the EPA report, (EPA 450/3-74-038) "Guideline specifications for the Development of Instruction Manuals for Automatic Air Monitoring In-

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manual may be used to satisfy the requirements of paragraphs (b) (1) and (2) of this section to the extent that it includes information necessary to meet those requirements.

(4) A statement that the candidate method has been tested in accordance with the procedures described in Subpart B of this part, Subpart C of this part, or both, as applicable.

(5) Test data, records, calculations, and test results as specified in Subpart B of this part, Subpart C of this part, or both, as applicable.

(6) A statement that the method or analyzer tested in accordance with this part is representative of the candidate method described in the application.

(c) For candidate automated methods, the application shall also contain the following:

(1) A detailed description of the quality control program that will be utilized, if the candidate method is designated as a reference or equivalent method, to ensure that all analyzers offered for sale under that designation will have essentially the same performance characteristics as the analyzer tested in accordance with this part.

(2) A description of the durability characteristics of such analyzers (see § 53.9(c)).

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18168, Apr. 25, 1975]

§ 53.5 Processing of applications.

After receiving an application for a reference or equivalent method determination, the Administrator will publish notice of the application in the FEDERAL REGISTER and, within 75 calendar days after receipt of the application, take one or more of the following actions:

(a) Send notice to the applicant, in accordance with § 53.8, that the candidate method has been determined to be a reference or equivalent method;

(b) Send notice to the applicant that his application has been rejected, including a statement of reasons for rejection;

(c) Send notice to the applicant that additional information must be submitted before a determination can be made and specify the additional information that is needed (in such cases, the 75-day period shall commence upon receipt of the additional information);

(d) Send notice to the applicant that additional tests are necessary and specify what tests are necessary and how they shall be interpreted (in such cases, the 75-day period shall commence upon receipt of the additional test data); or

(e) Send notice to the applicant that additional tests will be conducted by the Administrator, specifying the nature of and reasons for the additional tests and the estimated time required (in such cases, the 75-day period shall commence 1 calendar day after the additional tests have been completed).

§ 53.6 Right to witness conduct of tests.

(a) Submission of an application for a reference or equivalent method determination shall constitute consent for the Administrator or his authorized representative, upon presentation of appropriate credentials, to witness or observe any tests required by this part in connection with the application or in connection with any modification or intended modification of the method by the applicant.

(b) The applicant shall have the right to witness or observe any test conducted by the Administrator in connection with the application or in connection with any modification or intended modification of the method by the applicant.

(c) Any tests by either party that are to be witnessed or observed by the other party shall be conducted at a time and place mutually agreeable to both parties.

Footnote continued

struments," available from: National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151. (702-321-8543).

An example manual based on the above report and titled (EPA 450/3-74-039) "Fully Proceduralized Instruction Manual for the Bendix Ozone Monitor, Model 8002" is available from the same source.

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§ 53.7 Testing of methods at the initiative of the Administrator.

(a) In the absence of an application for a reference or equivalent method determination, the Administrator may conduct the tests required by this part for such a determination, may compile such other information as may be necessary in his judgment to make such a determination, and on the basis of the tests and information may determine that a method satisfies applicable requirements of this part.

(b) In the absence of an application requesting the Administrator to consider revising an appendix to Part 50 of this chapter in accordance with § 53.16, the Administrator may conduct such tests and compile such information as may be necessary in his judgment to make a determination under § 53.16(d) and on the basis of the tests and information make such a determination.

(c) If a method tested in accordance with this section is designated as a reference or equivalent method in accordance with § 53.8 or is specified or designated as a reference method in accordance with § 53.16, any person who offers the method for sale as a reference or equivalent method thereafter shall assume the rights and obligations of an applicant for purposes of this part with the exception of those pertaining to submission and processing of applications.

[40 FR 7049, Feb. 18, 1975, as amended at 41 FR 11256, Mar. 17, 1976]

§ 53.8 Designation of reference and equivalent methods.

(a) A candidate method determined by the Administrator to satisfy the applicable requirements of this part shall be designated as a reference method or equivalent method (as applicable), and a notice of the designation shall be submitted for publication in the FEDERAL REGISTER not later than 15 days after the determination is made.

(b) A notice indicating that the method has been determined to be a reference method or an equivalent method shall be sent to the applicant. This notice shall constitute proof of the determination until a notice of designation is published in accordance with paragraph (a) of this section.

(c) The Administrator will maintain a current list of methods designated as reference or equivalent methods in accordance with this part and will send a copy of the list to any person or group upon request. A copy of the list will be available for inspection or copying at EPA Regional Offices.

§ 53.9 Conditions of designation.

Designation of a candidate method as a reference method or equivalent method shall be conditioned on the applicant's compliance with the following requirements. Failure to comply with any of the requirements shall constitute a ground for cancellation of the designation in accordance with § 53.11.

(a) Any method offered for sale as a reference or equivalent method shall be accompanied by a copy of the manual referred to in § 53.4(b)(3) when delivered to any ultimate purchaser.

(b) Any method offered for sale as a reference or equivalent method shall generate no unreasonable hazard to operators or to the environment during normal use or (if the method is automated) during normal use or when malfunctioning.

(c) Any analyzer offered for sale as a reference or equivalent method shall function within the limits of the performance specifications referred to in § 53.20(a) for at least 1 year after delivery and acceptance when maintained and operated in accordance with the manual referred to in § 53.4(b)(3).

(d) Any analyzer offered for sale as a reference or equivalent method shall bear a prominent, permanently affixed label or sticker indicating that the analyzer has been designated by EPA as a reference method or as an equivalent method (as applicable) in accordance with this part.

(e) If an analyzer is offered for sale as a reference or equivalent method but has one or more selectable ranges, the label or sticker required by paragraph (d) of this section shall be placed in close proximity to the range selector and shall indicate clearly

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which range or ranges have been designated as parts of the reference or equivalent method.

(f) An applicant who offers analyzers for sale as reference or equivalent methods shall maintain an accurate and current list of the names and mailing addresses of all ultimate purchasers of such analyzers. For a period of seven years after publication of the reference or equivalent method designation applicable to such an analyzer, the applicant shall notify all ultimate purchasers of the analyzer within 30 days if the designation has been cancelled in accordance with § 53.11 or § 53.16 or if adjustment of the analyzer is necessary under § 53.11(b).

(g) If an applicant modifies an analyzer that has been designated as a reference or equivalent method, the applicant shall not sell the analyzer as modified as a reference or equivalent method nor attach a label or sticker to the analyzer as modified under paragraph (d) or (e) of this section until he has received notice under § 53.14(c) that the existing designation or a new designation will apply to the analyzer as modified or has applied for and received notice under § 53.8(b) of a new reference or equivalent method determination for the analyzer as modified.

[40 FR 7049, Feb. 18, 1975, as amended at 41 FR 11258, Mar. 17, 1976]

§ 53.10 Appeal from rejection of application.

Any applicant whose application for a reference or equivalent method determination has been rejected may appeal the Administrator's decision by taking one or more of the following actions:

(a) The applicant may submit new or additional information in support of the application.

(b) The applicant may request that the Administrator reconsider the data and information already submitted.

(c) The applicant may request that any test conducted by the Administrator that was a material factor in his decision to reject the application be repeated.

§ 53.11 Cancellation of reference or equivalent method designation.

(a) *Preliminary finding.* If the Administrator makes a preliminary finding on the basis of any information available to him that a representative sample of a method designated as a reference or equivalent method and offered for sale as such does not fully satisfy the requirements of this part or that there is any violation of the requirements set forth in § 53.9, he may initiate proceedings to cancel the designation in accordance with the following procedures.

(b) *Notification and opportunity to demonstrate or achieve compliance.* (1) After making a preliminary finding in accordance with paragraph (a) of this section, the Administrator will send notice of the preliminary finding to the applicant, together with a statement of the facts and reasons on which the preliminary finding is based, and will publish notice of the preliminary finding in the FEDERAL REGISTER.

(2) The applicant will be afforded an opportunity to demonstrate or to achieve compliance with the requirements of this part within 60 days after publication of notice in accordance with paragraph (b)(1) of this section or within such further period as the Administrator may allow, by demonstrating to the satisfaction of the Administrator that the method in question satisfies the requirements of this part, by commencing a program to make any adjustments that are necessary to bring the method into compliance, or by taking such action as may be necessary to cure any violation of the requirements of § 53.9. If adjustments are necessary to bring the method into compliance, all such adjustments shall be made within a reasonable time as determined by the Administrator. If the applicant demonstrates or achieves compliance in accordance with this paragraph (b)(2), the Administrator will publish notice of such demonstration or achievement in the FEDERAL REGISTER.

(c) *Request for hearing.* Within 60 days after publication of notice in accordance with paragraph (b)(1) of this section, the applicant or any interest-

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ed person may request a hearing as provided in § 53.12.

(d) *Notice of cancellation.* If, at the end of the period referred to in paragraph (b)(2) of this section, the Administrator determines that the reference or equivalent method designation should be cancelled, he will publish a notice of cancellation in the FEDERAL REGISTER and delete the designation from the list maintained under § 53.8(c). If a hearing has been requested and granted in accordance with § 53.12, action under this paragraph (d) will be taken only after completion of proceedings (including any administrative review) conducted in accordance with § 53.13 and only if the decision of the Administrator reached in such proceedings is that the designation in question should be cancelled.

§ 53.12 Request for hearing on cancellation.

Within 60 days after publication of notice in accordance with § 53.11(b)(1), the applicant or any interested person may request a hearing on the Administrator's action. The request shall be in writing, signed by an authorized representative of the applicant or interested person, and shall include a statement specifying (a) any objections to the Administrator's action and (b) data or other information in support of such objections. If, after reviewing the request and supporting data, the Administrator finds that the request raises a substantial issue of fact, he will grant a hearing in accordance with § 53.13 with respect to such issue.

§ 53.13 Hearings.

(a)(1) After granting a request for a hearing under § 53.12, the Administrator will designate a presiding officer for the hearing.

(2) If a time and place for the hearing have not been fixed by the Administrator, the hearing will be held as soon as practicable at a time and place fixed by the presiding officer, except that the hearing shall in no case be held sooner than 30 days after publication of a notice of hearing in the FEDERAL REGISTER.

(3) For purposes of the hearing, the parties shall include the Environmental Protection Agency, the applicant or interested person(s) who requested the hearing, and any person permitted to intervene in accordance with paragraph (c) of this section.

(4) The Deputy General Counsel or his representative will represent the Environmental Protection Agency in any hearing under this section.

(5) Each party other than the Environmental Protection Agency may be represented by counsel or by any other duly authorized representative.

(b)(1) Upon his appointment, the presiding officer will establish a hearing file. The file shall contain copies of the notices issued by the Administrator pursuant to § 53.11(b)(1), together with any accompanying material, the request for a hearing and supporting data submitted therewith, the notice of hearing published in accordance with paragraph (a)(2) of this section, and correspondence and other material data relevant to the hearing.

(2) The hearing file shall be available for inspection by the parties or their representatives at the office of the presiding officer, except to the extent that it contains information identified in accordance with § 53.15.

(c) At his discretion, the presiding officer may permit any interested person to intervene in the hearing upon such a showing of interest as the presiding officer may require; provided that leave to intervene may be denied in the interest of expediting the hearing where it appears that the interests of the person seeking to intervene will be adequately represented by another party (or by other parties), including the Environmental Protection Agency.

(d)(1) The presiding officer, upon the request of any party or at his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues.

(ii) Stipulations, admissions of fact, and the introduction of documents.

(iii) Limitation of the number of expert witnesses.

(iv) Possibility of agreement disposing of all or any of the issues in dispute.

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

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(2) The results of the conference shall be reduced to writing by the presiding officer and made part of the record.

(e)(1) Hearings shall be conducted by the presiding officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to exclusion by the presiding officer of irrelevant, immaterial, or repetitious evidence.

(2) Witnesses shall be placed under oath.

(3) Any witness may be examined or cross-examined by the presiding officer, the parties, or their representatives. The presiding officer may, at his discretion, limit cross-examination to relevant and material issues.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased from the reporter.

(5) All written statements, charts, tabulations, and data offered in evidence at the hearing shall, upon a showing satisfactory to the presiding officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute part of the record.

(6) Oral argument shall be permitted. The presiding officer may limit oral presentations to relevant and material issues and designate the amount of time allowed for oral argument.

(f)(1) The presiding officer shall make an initial decision which shall include written findings and conclusions and the reasons therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to, or review on motion of, the Administrator within 30-calendar days after the initial decision is filed.

(2) On appeal from or review of the initial decision, the Administrator will have all the powers which he would have in making the initial decision, including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the presiding officer for additional proceedings. The decision by the Administrator will include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

§ 53.14 Modification of a reference or equivalent method.

(a) An applicant who offers a method for sale as a reference or equivalent method shall report any intended modification of the method, including but not limited to modifications of design or construction or of operational and maintenance procedures specified in the operation manual, to the Administrator prior to implementation of the modification (see § 53.9(g)). The report shall be signed by an authorized representative of the applicant, marked in accordance with § 53.15 (if applicable), and addressed as specified in § 53.4(a).

(b) A report submitted under paragraph (a) of this section shall include:

(1) A description, in such detail as may be appropriate, of the intended modification;

(2) A brief statement of the applicant's belief that the modification will, will not, or may affect the performance characteristics of the method;

(3) If the applicant believes the modification will or may affect the performance characteristics of the method, a brief statement of the probable effect; and

(4) Such further information, including test data, as may be necessary to explain and support any statement required by paragraphs (b)(2) and (b)(3) of this section.

(c) Within 30-calendar days after receiving a report under paragraph (a) of this section, the Administrator will take one or more of the following actions:

(1) Notify the applicant that the designation will continue to apply to the method if the modification is implemented.

(2) Send notice to the applicant that a new designation will apply to the method (as modified) if the modification is implemented, submit notice of the determination for publication in

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the FEDERAL REGISTER, and revise or supplement the list referred to in § 53.8(c) to reflect the determination.

(3) Send notice to the applicant that the designation will not apply to the method (as modified) if the modification is implemented and submit notice of the determination for publication in the FEDERAL REGISTER;

(4) Send notice to the applicant that additional information must be submitted before a determination can be made and specify the additional information that is needed (in such cases, the 30-day period shall commence upon receipt of the additional information);

(5) Send notice to the applicant that additional tests are necessary and specify what tests are necessary and how they shall be interpreted (in such cases, the 30-day period shall commence upon receipt of the additional test data); or

(6) Send notice to the applicant that additional tests will be conducted by the Administrator and specify the reasons for and the nature of the additional tests (in such cases, the 30-day period shall commence one calendar day after the additional tests are completed).

(d) An applicant who has received a notice under paragraph (c)(3) of this section may appeal the Administrator's action as follows:

(1) The applicant may submit new or additional information pertinent to the intended modification.

(2) The applicant may request the Administrator to reconsider data and information already submitted.

(3) The applicant may request that the Administrator repeat any test he conducted that was a material factor in his determination. A representative of the applicant may be present during the performance of any such retest.

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18168, Apr. 25, 1975; 41 FR 11256, Mar. 17, 1976]

§ 53.15 Trade secrets and confidential or privileged information.

Any information submitted under this part that is claimed to be a trade secret or confidential or privileged information shall be marked or otherwise clearly identified as such in the submittal. Information so identified will be treated in accordance with Part 2 of this chapter (concerning public information).

§ 53.16 Supersession of reference methods.

(a) This section prescribes procedures and criteria applicable to requests that the Administrator specify a new reference method, or a new measurement principle and calibration procedure on which reference methods shall be based, by revision of the appropriate appendix to Part 50 of this chapter. Such action will ordinarily be taken only if the Administrator determines that a candidate method or a variation thereof is substantially superior to the existing reference method(s).

(b) In exercising his discretion under this section, the Administrator will consider: (1) The benefits, in terms of the requirements and purposes of the Act, that would result from specifying a new reference method or a new measurement principle and calibration procedure; (2) the potential economic consequences of such action for State and local control agencies; and (3) any disruption of State and local air quality monitoring programs that might result from such action.

(c) An applicant who wishes the Administrator to consider revising an appendix to Part 50 of this chapter on the ground that the applicant's candidate method is substantially superior to the existing reference method(s) shall submit an application for a reference or equivalent method determination in accordance with § 53.4 and shall indicate therein that he desires such consideration. The application shall include, in addition to the information required by § 53.4, data and any other information supporting the applicant's claim that the candidate method is substantially superior to the existing reference method(s).

(d) After receiving an application under paragraph (c) of this section, the Administrator will publish notice of its receipt in the FEDERAL REGISTER and, within 75 calendar days after receipt of the application, take one of the following actions:

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(1) Determine that it is appropriate to propose a revision of the appendix in question and send notice of the determination to the applicant;

(2) Determine that it is inappropriate to propose a revision of the appendix in question, determine whether the candidate method is a reference or equivalent method, and send notice of the determinations, including a statement of reasons for the determination not to propose a revision, to the applicant;

(3) Send notice to the applicant that additional information must be submitted before a determination can be made and specify the additional information that is needed (in such cases, the 75-day period shall commence upon receipt of the additional information);

(4) Send notice to the applicant that additional tests are necessary, specifying what tests are necessary and how they shall be interpreted (in such cases, the 75-day period shall commence upon receipt of the additional test data); or

(5) Send notice to the applicant that additional tests will be conducted by the Administrator, specifying the nature of and reasons for the additional tests and the estimated time required (in such cases, the 75-day period shall commence one calendar day after the additional tests have been completed).

(e) (1) After making a determination under paragraph (d)(1) of this section, the Administrator will publish a notice of proposed rulemaking in the FEDERAL REGISTER. The notice will indicate that the Administrator proposes (i) to revise the appendix in question; (ii) where the appendix specifies a measurement principle and calibration procedure, to cancel reference method designations based on the appendix; and (iii) to cancel equivalent method designations based on the existing reference method(s). The notice will include the terms or substance of the proposed revision, will indicate what period(s) of time the Administrator proposes to allow for replacement of existing methods under section 2.3 of Appendix C to Part 58 of this chapter, and will solicit public comments on the proposal with particular reference to the considerations set forth in paragraphs (a) and (b) of this section.

(2) If, after consideration of comments received, the Administrator determines that the appendix in question should be revised, he will by publication in the FEDERAL REGISTER (i) promulgate the proposed revision, with such modifications as may be appropriate in view of comments received; (ii) where the appendix (prior to revision) specifies a measurement principle and calibration procedure, cancel reference method designations based on the appendix; (iii) cancel equivalent method designations based on the existing reference method(s); and (iv) specify the period(s) that will be allowed for replacement of existing methods under section 2.3 of Appendix C to Part 58 of this chapter, with such modifications from the proposed period(s) as may be appropriate in view of comments received. Cancelled designations will be deleted from the list maintained under § 53.8(c). The requirements and procedures for cancellation set forth in § 53.11 shall be inapplicable to cancellation of reference or equivalent method designations under this section.

(3) If the appendix in question is revised to specify a new measurement principle and calibration procedure on which the applicant's candidate method is based, the Administrator will take appropriate action under § 53.5 to determine whether the candidate method is a reference method.

(4) Upon taking action under paragraph (e)(2) of this section, the Administrator will send notice of the action to all applicants for whose methods reference and equivalent method designations are cancelled by such action.

(f) An applicant who has received notice of a determination under paragraph (d)(2) of this section may appeal the determination by taking one or more of the following actions:

(1) The applicant may submit new or additional information in support of the application.

(2) The applicant may request that the Administrator reconsider the data and information already submitted.

(3) The applicant may request that any test conducted by the Administra-

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tor that was a material factor in making the determination be repeated.

(Secs. 110, 301(a), 313, 319, Clean Air Act (42 U.S.C. 7410, 7601(a) 7613, 7619))

[41 FR 11256, Mar. 17, 1976, as amended at 44 FR 27571, May 10, 1979]

Subpart B—Procedures for Testing Performance Characteristics of Automated Methods

§ 53.20 General provisions.

(a) The test procedures given in this subpart shall be used to test the performance of candidate automated methods against the performance specifications given in Table B-1. A test analyzer representative of the candidate automated method must exhibit performance better than, or equal to, the specified value for each such specification (except Range) to satisfy the requirements of this subpart. Except as provided in paragraph (b) of this section, the range of the candidate method must be the range specified in Table B-1 to satisfy the requirements of this subpart.

(b) For a candidate method having more than one selectable range, one range must be that specified in Table B-1 and a test analyzer representative of the method must pass the tests required by this subpart while operated in that range. The tests may be repeated for a broader range (i.e., one extending to higher concentrations) than that specified in Table B-1 provided that the range does not extend to concentrations more than two times the upper range limit specified in Table B-1. If the application is for a reference method determination, the tests may be repeated for a narrower range (one extending to lower concentrations) than that specified in Table B-1. If the tests are conducted or passed only for the specified range, any reference or equivalent method determination with respect to the method will be limited to that range. If the tests are passed for both the specified range and a broader range (or ranges), any such determination will include the broader range(s) as well as the specified range, provided that the tests required by Subpart C of this part (if applicable) are met for the broader range(s). If the tests are passed for both the specified range and a narrower range, a reference method determination for the method will include the narrower range as well as the specified range. Appropriate test data shall be submitted for each range sought to be included in a reference or equivalent method determination under this paragraph (b).

(c) For each performance specification (except Range), the test procedure shall be initially repeated seven (7) times to yield 7 test results. Each result shall be compared with the corresponding specification in Table B-1; a value higher than or outside that specified constitutes a failure. These 7 results for each parameter shall be interpreted as follows:

(1) Zero (0) failures: Candidate method passes the performance parameter.

(2) Three (3) or more failures: Candidate method fails the performance parameter.

(3) One (1) or two (2) failures: Repeat the test procedures for the parameter eight (8) additional times yielding a total of fifteen (15) test results. The combined total of 15 test results shall then be interpreted as follows:

(i) One (1) or two (2) failures: Candidate method passes the performance parameter.

(ii) Three (3) or more failures: Candidate method fails the performance parameter.

TABLE B-1.—PERFORMANCE SPECIFICATIONS FOR AUTOMATED METHODS

Performance parameter	Units [1]	Sulfur dioxide	Photochemical oxidants	Carbon monoxide	Nitrogen dioxide	Definitions and test procedures
1. Range	Parts per million	0-0.5	0-0.5	0-50	0-0.5	Sec. 53.23(a).
2. Noise	do	.005	.005	.50	.005	Sec. 53.23(b).

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TABLE B-1.—PERFORMANCE SPECIFICATIONS FOR AUTOMATED METHODS—Continued

Performance parameter	Units [1]	Sulfur dioxide	Photochemical oxidants	Carbon monoxide	Nitrogen dioxide	Definitions and test procedures
3. Lower detectable limit	ppm	.01	.01	1.0	.01	Sec. 53.23(c).
4. Interference equivalent						Sec. 53.23(d).
Each interferant	ppm	±.02	±.02	±1.0	±0.02	
Total interferant	ppm	.06	.06	1.5	.04	
5. Zero drift, 12 and 24 hour	ppm	±.02	±.02	±1.0	±.02	Sec. 52.23(e).
6. Span drift, 24 hour						Do.
20 percent of upper range limit	Percent	±20.0	±20.0	±10.0	±20.0	
80 percent of upper range limit	do	±5.0	±5.0	±2.5	±5.0	
7. Lag time	Minutes	20	20	10	20	Do.
8. Rise time	do	15	15	5	15	Do.
9. Fall time	do	15	15	5	15	Do.
10. Precision						Do.
20 percent of upper range limit	Parts per million	.01	.01	.5	.02	
80 percent of upper range limit	do	.015	.01	.5	.03	

[1] To convert from parts per million to $\mu g/m^3$ at 25°C and 760 mm Hg, multiply by M/0.02447, where *M* is the molecular weight of the gas.

(d) The tests for *zero drift, span drift, lag time, rise time, fall time,* and *precision* shall be combined into a single sequential procedure to be conducted at various line voltages and ambient temperatures specified in § 53.23(e). The tests for *noise, lower detectable limit,* and *interference equivalents* shall be made at any temperature between 20° C. and 30° C. and at any normal line voltage between 105 and 125 volts, and shall be conducted such that not more than three (3) test results for each parameter are obtained per 24 hours.

(e) All response readings to be recorded shall first be converted to concentration units according to the calibration curve constructed in accordance with § 53.21(b).

(f) All recorder chart tracings, records, test data and other documentation obtained from or pertinent to these tests shall be identified, dated, signed by the analyst performing the test, and submitted.

NOTE: Suggested formats for reporting the test results and calculations are provided in Figures B-2, B-3, B-4, B-5, and B-6 in Appendix A. Symbols and abbreviations used in this subpart are listed in Table B-5, Appendix A.

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18168, Apr. 25, 1975; 41 FR 52694, Dec. 1, 1976]

§ 53.21 Test conditions.

(a) *Set-up and start-up* of the test analyzer shall be in strict accordance with the operating instructions specified in the manual referred to in § 53.4(b)(3). Allow adequate warm-up or stabilization time as indicated in the operating instructions before beginning the tests. If the candidate method does not include an integral strip chart recorder, connect the output signal of the test analyzer to a suitable strip chart recorder of the servo, null-balance type. This recorder shall have a chart width of at least 25 centimeters, chart speeds up to 10 cm per hour, a response time of 1 second or less, a deadband of not more than 0.25 percent of full scale, and capability either of reading measurements at least 5 percent below zero or of offsetting the zero by at least 5 percent.

NOTE: Other data acquisition components may be used along with the chart recorder during conduct of these tests. Use of the chart recorder is intended only to facilitate evaluation of data submitted.

(b) *Calibration* of the test analyzer shall be as indicated in the manual referred to in § 53.4(b)(3) and as follows: If the chart recorder does not have below zero capability, adjust either the controls of the test analyzer or the chart recorder to obtain a +5% offset zero reading on the recorder chart to facilitate observing negative response or drift. If the candidate method is not capable of negative response, the test analyzer (not recorder) shall be operated with an offset zero. Construct and submit a calibration curve show-

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ing a plot of recorder scale readings (ordinate) against pollutant concentrations (abscissa). A plot of output units (volts, millivolts, milliamps, etc.) against pollutant concentrations shall also be shown for methods not including an integral chart recorder. All such plots shall consist of at least seven (7) approximately equally spaced, identifiable points, including 0 and 90±5 percent of full scale.

(c) Once the test analyzer has been set up and calibrated and the tests started, manual adjustment or normal periodic maintenance is permitted only every 3 days. Automatic adjustments which the test analyzer performs by itself are permitted at any time. The submitted records shall show clearly when any manual adjustment or periodic maintenance was made and describe the operations performed.

(d) If the test analyzer should malfunction during any of the performance tests, the tests for that parameter shall be repeated. A detailed explanation of the malfunction, remedial action taken, and whether recalibration was necessary (along with all pertinent records and charts) shall be submitted. If more than one malfunction occurs, all performance test procedures for all parameters shall be repeated.

(e) Tests for all performance parameters shall be completed on the same test analyzer, except that use of multiple test analyzers to accelerate testing will be permitted when alternate ranges of a multi-range candidate method are being tested.

§ 53.22 Generation of test atmospheres.

(a) Table B-2 specifies preferred methods for generating test atmospheres and suggested methods of verifying the concentrations. Only one means of establishing the concentration of a test atmosphere is normally required. If the method of generation can produce reproducible concentrations, verification is optional. If the method of generation is not reproducible, then establishment of the concentration by some verification method is required. However, when a method of generation other than that given in Table B-2 is used, the test concentration shall be verified.

(b) The test atmosphere delivery system shall be designed and constructed so as not to significantly alter the test atmosphere composition or concentration during the period of the test. The delivery system shall be fabricated from borosilicate glass or FEP Teflon.

(c) The output of the test atmosphere generation system shall be sufficiently stable to obtain stable response during the required tests. If a permeation device is used for generation of a test atmosphere, the device, as well as the air passing over it, shall be controlled to ±0.1° C.

(d) All diluent air shall be zero air free of contaminants likely to cause a detectable response on the test analyzer.

TABLE B-2. TEST ATMOSPHERES

Test gas	Generation	Verification
Ammonia	Permeation device. Similar to system described in references 1 and 2.	Indophenol method, reference 3.
Carbon dioxide	Cylinder of zero air or nitrogen containing CO_2 as required to obtain the concentration specified in table B-3.	Use NBS-certified standards whenever possible. If NBS standards are not available, obtain 2 standards from independent sources which agree within 2 percent; or obtain one standard and submit it to an independent laboratory for analysis which must agree within 2 percent of the supplier's nominal analysis.
Carbon monoxide	Cylinder of zero air or nitrogen containing CO as required to obtain the concentration specified in table B-3.	Do.
Ethane	Cylinder of zero air or nitrogen containing ethane as required to obtain the concentration specified in table B-3.	Do.
Ethylene	Cylinder of prepurified nitrogen containing ethylene as required to obtain the concentration specified in table B-3.	Do.

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TABLE B-2. TEST ATMOSPHERES—Continued

Test gas	Generation	Verification
Hydrogen chloride.	Cylinder [1] of prepurified nitrogen containing approximately 100 p/m of gaseous HCl. Dilute with zero air to concentration specified in table B-3.	Collect samples in bubbler containing distilled water and analyze by the mercuric thiocyanate method, ASTM (D512), p. 29, reference 4.
Hydrogen sulfide ...	Permeation device system described in references 1 and 2.	Tentative method of analysis for H_2S content of the atmosphere, p. 426, reference 5.
Methane.....	Cylinder of zero air containing methane as required to obtain the concentration specified in table B-3.	Use NBS-certified standards whenever possible. If NBS standards are not available, obtain 2 standards from independent sources which agree within 2 percent; or obtain one standard and submit it to an independent laboratory for an analysis which must agree within 2 percent of the supplier's nominal analysis.
Nitric oxide	Cylinder [1] of prepurified nitrogen containing approximately 100 p/m NO. Dilute with zero air to required concentration.	Gas-phase titration as described in reference 6, section 7.1.
Nitrogen dioxide	1. Gas phase titration as described in reference 6. 2. Permeation device, similar to system described in references 1 and 2.	1. Use an NO_2 analyzer calibrated with a gravimetrically calibrated permeation device. 2. Use an NO_2 analyzer calibrated by gas-phase titration as described in reference 6.
Ozone	Calibrated ozone generator as described in reference 7, Appendix D.	Use an ozone analyzer calibrated by gas-phase titration as described in reference 6.
Sulfur dioxide	Permeation device Similar to system described in reference method for SO_2, reference 7, Appendix A.	P-rosaniline method. Reference 7, Appendix A.
Water	Pass zero air through distilled water at a fixed known temperature between 20° and 30° C. such that the air stream becomes saturated. Dilute with zero air to concentration specified in table B-3.	Measure relative humidity by means of a dew-point indicator, calibrated electrolytic or piezo electric hygrometer, or wet/dry bulb thermometer.
Xylene	Cylinder of prepurified nitrogen containing 100 p/m xylene. Dilute with zero air to concentration specified in table B-3.	Use NBS-certified standards whenever possible. If NBS standards are not available, obtain 2 standards from independent sources which agree within 2 percent; or obtain one standard and submit it to an independent laboratory for an analysis which must agree within 2 percent of the supplier's nominal analysis.
Zero air	1. Ambient air purified by appropriate scrubbers or other devices such that it is free of contaminants likely to cause a detectable response on the analyzer. 2. Cylinder of compressed zero air certified by the supplier or an independent laboratory to be free of contaminants likely to cause a detectable response on the analyzer.	

[1] Use stainless steel pressure regulator dedicated to the pollutant measured.

Reference 1. O'Keeffe, A. E., and Ortaman, G. C. "Primary Standards for Trace Gas Analysis," *Anal. Chem.* 38, 760 (1966).
Reference 2. Scaringelli, F. P., A. E., Rosenberg, E., and Bell, J. P., "Primary Standards for Trace Gas Analysis." *Anal. Chem.* 42, 871 (1970).
Reference 3. "Tentative Method of Analysis for Ammonia in the Atmosphere (Indophenol Method)", *Health Lab Sciences*, vol. 10, No. 2, 115-118, April 1973.
Reference 4. *1973 Annual Book of ASTM Standards*, American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa.
Reference 5. *Methods for Air Sampling and Analysis*, Intersociety Committee, 1972, American Public Health Association, 1015.
Reference 6. *Federal Register*, vol. 38, No. 110, Tentative Method for the Continuous Measurement of Nitrogen Dioxide (Chemiluminescent) addenda C. (June 8, 1973).
Reference 7. *Federal Register*, vol. 36, No. 228, National Primary and Secondary Ambient Air Quality Standards, Nov. 25, 1971.

(e) The concentration of each test atmosphere shall be established and/or verified before or during each series of tests. Samples for verifying test concentrations shall be collected from the test atmosphere delivery system as close as possible to the sample intake port of the test analyzer.

(f) The accuracy of all flow measurements used to calculate test atmosphere concentrations shall be documented and referenced to a primary standard (such as a spirometer, bubble meter, etc.). Any corrections shall be clearly shown. All flow measurements given in volume units shall be standardized to 25° C. and 760 mm Hg.

(g) Schematic drawings and other information showing complete procedural details of the test atmosphere gen-

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eration, verification, and delivery system shall be provided. All pertinent calculations shall be clearly indicated.

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18168, Apr. 25, 1975]

§ 53.23 Test procedures.

(a) *Range*—(1) *Technical Definition.* Nominal minimum and maximum concentrations which a method is capable of measuring.

NOTE: The nominal range is specified at the lower and upper range limits in concentration units, for example, 0–0.5 p/m.

(2) *Test Procedure.* Submit a suitable calibration curve, as specified in § 53.21(b), showing the test analyzer's response over at least 95 percent of the required range.

NOTE: A single calibration curve will normally suffice.

(b) *Noise*—(1) *Technical Definition.* Spontaneous, short duration deviations in output, about the mean output, which are not caused by input concentration changes. Noise is determined as the standard deviation about the mean and is expressed in concentration units.

(2) *Test Procedure.* (i) Allow sufficient time for the test analyzer to warm up and stabilize. Determine at two concentrations, first using zero air and then a pollutant test gas concentration as indicated below. The noise specification in Table B-1 shall apply to both of these tests.

(ii) Connect an integrating-type digital meter (DM) suitable for the test analyzer's output and accurate to three significant digits, to measure the analyzer's output signal.

NOTE: Use of a chart recorder in addition to the DM is optional.

(iii) Measure zero air for 60 minutes. During this 60-minute interval, record twenty-five (25) readings at 2-minute intervals. (See Figure B-2 in Appendix A.)

(iv) Convert each DM reading to concentration units (p/m) by reference to the test analyzer's calibration curve as determined in § 53.21(b). Label the converted DM readings r_1, r_2, $r_3 \ldots r_i \ldots r_{25}$.

(v) Calculate the standard deviation, S, as follows:

$$S=\sqrt{\frac{\sum_{i=1}^{25}(r_i)^2-\frac{1}{25}\left(\sum_{i=1}^{25}r_i\right)^2}{24}}\ (p/m)$$

where i indicates the i-th DM reading in ppm.

(vi) Let S at 0 ppm be identified as S_0; compare S_0 to the noise specification given in Table B-1.

(vii) Repeat steps (iii) through (vi) of this section using a pollutant test atmosphere concentration of 80±5 percent of the upper range limit (URL) instead of zero gas, and let S at 80 percent of the URL be identified as S_{80}. Compare S_{80} to the noise specification given in Table B-1.

(viii) Both S_0 and S_{80} must be less than or equal to the specification for noise to pass the test for the noise parameter.

(c) *Lower Detectable Limit*—(1) *Technical Definition.* The minimum pollutant concentration which produces a signal of twice the noise level.

(2) *Test Procedure.* (i) Allow sufficient time for the test analyzer to warm up and stabilize. Measure zero air and record the stable reading in ppm as B_Z. (See Figure B-3 in Appendix A.)

(ii) Generate and measure a pollutant test atmosphere concentration equal to the value for the lower detectable limit specified in Table B-1.

NOTE: If necessary, the test atmosphere concentration may be generated or verified at a higher concentration, then accurately diluted with zero air to the final required concentration.

(iii) Record the test analyzer's stable indicated reading, in ppm, as B_L.

(iv) Determine the Lower Detectable Limit (LDL) as LDL=B_L-B_Z. Compare this LDL value with the noise level, S_0, determined in § 53.23(b), for 0 concentration test atmosphere. LDL must be equal to or higher than $2S_0$ to pass this test.

(d) *Interference Equivalent*—(1) *Technical Definition.* Positive or negative response caused by a substance other than the one being measured.

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(2) *Test Procedure.* The test analyzer shall be tested for all substances likely to cause a detectable response. The test analyzer shall be challenged, in turn, with each interfering agent specified in Table B-3. In the event that there are substances likely to cause a significant interference which have not been specified in Table B-3, these substances shall be tested at a concentration substantially higher than that normally found in the ambient air. The interference may be either positive or negative, depending on whether the test analyzer's response is increased or decreased by the presence of the interferent. Interference equivalents shall be determined by mixing each interferent, one at a time, with the pollutant at the concentrations specified in Table B-3, and comparing the test analyzer's response to the response caused by the pollutant alone. Known gas-phase reactions that might occur between an interferent and the pollutant are designated by footnote (3) in Table B-3. In these cases, the interference equivalent shall be determined in the absence of the pollutant.

(i) Allow sufficient time for warm-up and stabilization of the test analyzer.

(ii) For a candidate method using a prefilter or scrubber based upon a chemical reaction to derive part of its specificity, and which requires periodic service or maintenance, the test analyzer shall be "conditioned" prior to each interference test as follows:

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TABLE B-3—INTERFERANT TEST CONCENTRATION,[1] PARTS PER MILLION

Pollutant	Analyzer type [2]	Hydrochloric acid	Ammonia	Hydrogen sulfide	Sulfur dioxide	Nitrogen dioxide	Nitric oxide	Carbon dioxide	Ethylene	Ozone	M-xylene	Water vapor	Carbon monoxide	Methane	Ethane
SO_2	Flame photometric (FPD)			0.1	[3]0.14			750				[3]20,000	50		
SO [2]	Gas chromatography (FPD)			.1	[4].14			750				[3]20,000	50		
SO_2	Spectrophotometric-wet chemical (pararosaniline reaction).	0.2	[3]0.1	.1	[4].14	0.5		750		0.5					
SO_2	Electrochemical	.2	[3].1	.1	[4].14	.5	0.5		0.2	.5		[3]20,000			
SO_2	Conductivity	.2	[3].1		[4].14	.5		750							
SO_2	Spectrophotometric-gas phase				[4].14	.5	.5			.5	0.2				
O_3	Chemiluminescent			[3].1				750		[4].08		[3]20,000			
O_3	Electrochemical		[3].1		.5	.5				[4].08		[3]20,000			
O_3	Spectrophotometric-wet chemical (potassium iodide reaction).		[3].1		.5	.5	[3].5			[4].08					
O_3	Spectrophotometric-gas phase				.5	.5	[3].5			[4].08					
CO	Infrared							750				20,000	[4]10		
CO	Gas chromatography with flame ionization detector.											20,000	[4]10		0.5
CO	Electrochemical						.5		.2			20,000	[4]10		
CO	Catalytic combustion-thermal detection.		.1					750	.2			20,000	[4]10	5.0	.5
CO	IR fluorescence							750				20,000	[4]10		.5
CO	Mercury replacement UV photometric.								.2				[4]10		.5
NO_2	Chemiluminescent		[3].1		.5	[4].1	.5					20,000			
NO_2	Spectrophotometric-wet chemical (azo-dye reaction).				.5	[4].1	.5	750		.5					
NO [2]	Electrochemical	0.2	[3].1		.5	[4].1	.5	750		.5		20,000	50		
NO_2	Spectrophotometric-gas phase		[3].1		.5	[4].1	.5			.5		20,000	50		

[1] Concentrations of interferant listed must be prepared and controlled to ± 10 percent of the state value.
[2] Analyzer types not listed will be considered by the administrator as special cases.
[3] Do not mix with pollutant.
[4] Concentration of pollutant used for test. These pollutant concentrations must be prepared to ± 10 percent of the stated value.

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(A) Service or perform the indicated maintenance on the scrubber or prefilter as directed in the manual referred to in § 53.4(b)(3).

(B) Before testing for each interferent, allow the test analyzer to sample through the scrubber a test atmosphere containing the interferent at a concentration equal to the value specified in Table B-3. Sampling shall be at the normal flow rate and shall be continued for 6 continuous hours prior to testing.

(iii) Generate three test atmosphere streams as follows:

(A) Test atmosphere *P*: Pollutant concentration.

(B) Test atmosphere *I*: Interference concentration.

(C) Test atmosphere *Z*: Zero air.

(iv) Adjust the individual flow rates and the pollutant or interferent generators for the three test atmospheres as follows:

(A) The flow rates of test atmospheres *I* and *Z* shall be identical.

(B) The concentration of pollutant in test atmosphere *P* shall be adjusted such that when *P* is mixed (diluted) with either test atmosphere *I* or *Z*, the resulting concentration of pollutant shall be as specified in Table B-3.

(C) The concentration of interferent in test atmosphere *I* shall be adjusted such that when *I* is mixed (diluted) with test atmosphere *P*, the resulting concentration of interferent shall be equal to the value specified in Table B-3.

(D) To minimize concentration errors due to flow rate differences between *I* and *Z*, it is recommended that, when possible, the flow rate of *P* be from 10 to 20 times larger than the flow rates of *I* and *Z*.

(v) Mix test atmospheres *P* and *Z* by passing the total flow of both atmospheres through a mixing flask.

(vi) Sample and measure the mixture of test atmospheres *P* and *Z* with the test analyzer. Allow for a stable reading, and record the reading, in concentration units, as *R* (see Figure B-3).

(vii) Mix test atmospheres *P* and *I* by passing the total flow of both atmospheres through a mixing flask.

(viii) Sample and measure this mixture. Record the stable reading, in concentration units, as R_I.

(ix) Calculate the interference equivalent (*IE*) as:

$$IE = R_I - R$$

IE must be equal to or less than the specification given in Table B-1 for each interferent to pass the test.

(x) Follow steps (iii) through (ix) of this section, in turn, to determine the interference equivalent for each interferent.

(xi) For those interferents which cannot be mixed with the pollutant, as indicated by footnote (3) in Table B-3, adjust the concentration of test atmosphere *I* to the specified value without being mixed or diluted by the pollutant test atmosphere. Determine *IE* as follows:

(A) Sample and measure test atmosphere *Z* (zero air). Allow for a stable reading and record the reading, in concentration units, as *R*.

(B) Sample and measure the interferent test atmosphere *I*. If the test analyzer is not capable of negative readings, adjust the analyzer (not the recorder) to give an offset zero. Record the stable reading in concentration units as R_I, extrapolating the calibration curve, if necessary, to represent negative readings.

(C) Calculate $IE = R_I - R$. *IE* must be equal to or less than the specification in Table B-1 to pass the test.

(xii) Sum the absolute value of all the individual interference equivalents. This sum must be equal to or less than the total interferent specification given in Table B-1 to pass the test.

(e) *Zero Drift, Span Drift, Lag Time, Rise Time, Fall Time, and Precision*—(1) *Technical Definitions*—(i) *Zero Drift:* The change in response to zero pollutant concentration, over 12- and 24-hour periods of continuous unadjusted operation.

(ii) *Span Drift:* The percent change in response to an up-scale pollutant concentration over a 24-hour period of continuous unadjusted operation.

(iii) *Lag Time:* The time interval between a step change in input concentration and the first observable corresponding change in response.

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(iv) *Rise Time:* The time interval between initial response and 95 percent of final response after a step increase in input concentration.

(v) *Fall Time:* The time interval between initial response and 95 percent of final response after a step decrease in input concentration.

(vi) *Precision:* Variation about the mean of repeated measurements of the same pollutant concentration, expressed as one standard deviation about the mean.

(2) Tests for these performance parameters shall be accomplished over a period of seven (7) or more days. During this time, the line voltage supplied to the test analyzer and the ambient temperature surrounding the analyzer shall be varied from day to day. One test result for each performance parameter shall be obtained each test day, for seven (7) or fifteen (15) test days as necessary. The tests are performed sequentially in a single procedure.

(3) The 24-hour test day may begin at any clock hour. The first 12 hours out of each test day are required for testing 12-hour zero drift. Tests for the other parameters shall be conducted during the remaining 12 hours.

(4) Table B–4 specifies the line voltage and room temperature to be used for each test day. The line voltage and temperature shall be changed to the specified values at the start of each test day (i.e., at the start of the 12-hour zero test). Initial adjustments (day zero) shall be made at a line voltage of 115 volts (rms) and a room temperature of 25° C.

(5) The tests shall be conducted in blocks consisting of 3 test days each until 7 or 15 test results have been obtained. (The final block may contain fewer than three test days.) If a test is interrupted by an occurrence other than a malfunction of the test analyzer, only the block during which the interruption occurred shall be repeated.

(6) During each block, manual adjustments to the electronics, gas, or reagent flows or periodic maintenance shall not be permitted. Automatic adjustments which the test analyzer performs by itself are permitted at any time.

(7) At least 4 hours prior to the start of the first test day of each block, the test analyzer may be adjusted and/or serviced according to the periodic maintenance procedures specified in the manual referred to in § 53.4(b)(3). If a new block is to immediately follow a previous block, such adjustments or servicing may be done immediately after completion of the day's tests for the last day of the previous block and at the voltage and temperature specified for that day, but only on test days 3, 6, 9, and 12.

NOTE: If necessary, the beginning of the test days succeeding such maintenance or adjustment may be delayed as necessary to complete the service or adjustment operation.

(8) All response readings to be recorded shall first be converted to concentration units according to the calibration curve. Whenever a test atmosphere is to be measured but a stable reading is not required, the test atmosphere shall be measured long enough to cause a change in response of at least 10% of full scale. Identify all readings and other pertinent data on the strip chart. (See Figure B–1 illustrating the pattern of the required readings.)

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TABLE B-4—LINE VOLTAGE AND ROOM TEMPERATURE TEST CONDITIONS

Test day	Line voltage,[1] rms	Room temperature,[2] °C	Comments
0	115	25	Initial set-up and adjustments.
1	125	20	
2	105	20	
3	125	30	Adjustments and/or periodic maintenance permitted at end of tests.
4	105	30	
5	125	20	
6	105	20	Adjustments and/or periodic maintenance permitted at end of tests.
7	125	30	Examine test results to ascertain if further testing is required.
8	105	30	
9	125	20	Adjustments and/or periodic maintenance permitted at end of tests.
10	105	20	
11	125	30	
12	105	30	Adjustments and/or periodic maintenance permitted at end of tests.
13	125	20	
14	105	20	
15	125	30	

[1]Voltage specified shall be controlled to ± 1 volt.
[2]Temperature specified shall be controlled to ± 1°C.

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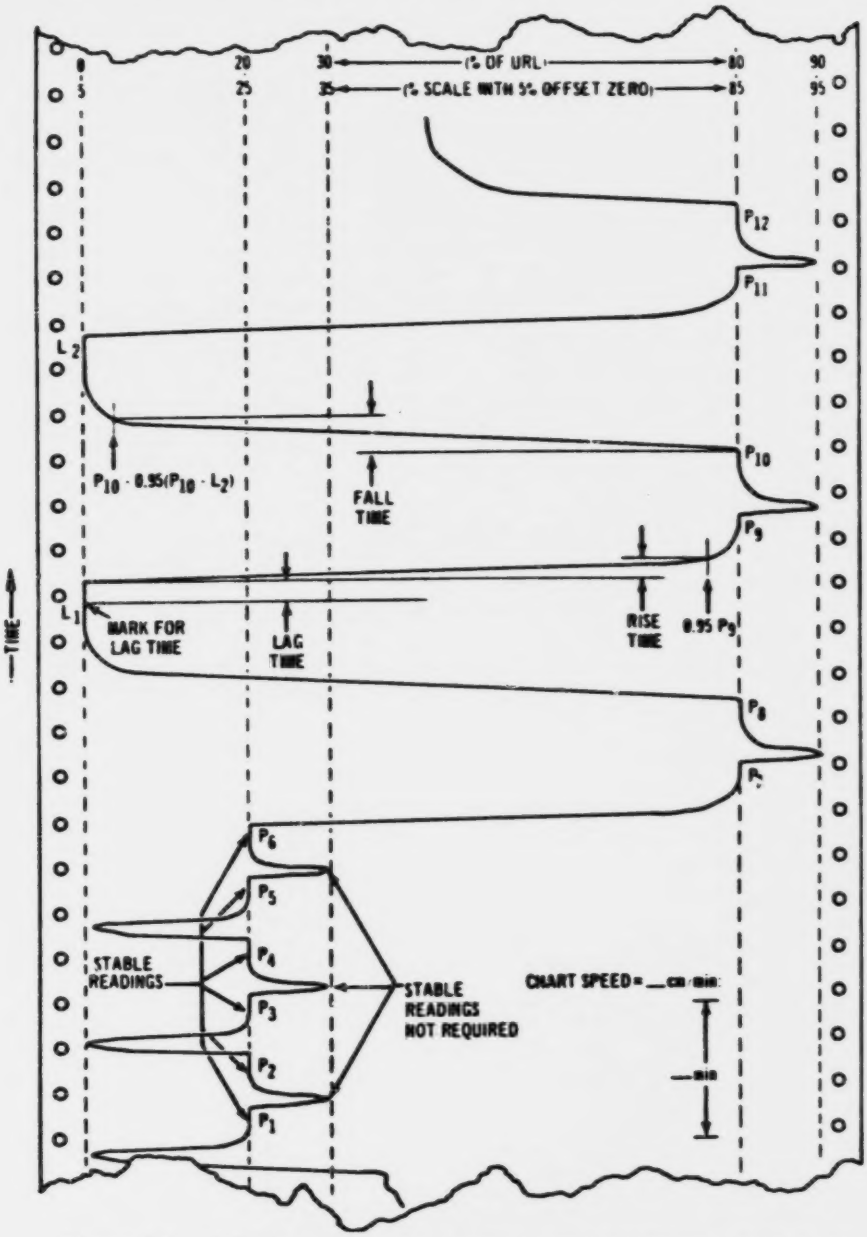

Figure B-1. Example showing the nature of the tracing obtained during the test for drift, lag time, rise time, fall time, and precision. The time scale has been greatly compressed.

(9) *Test Procedure.* (i) Arrange to generate pollutant test atmospheres as follows:

Test atmosphere	Pollutant concentration (percent)
A_0	Zero air.
A_{20}	20 ± 5 of the upper range limit.
A_{30}	30 ± 5 of the upper range limit.
A_{80}	80 ± 5 of the upper range limit.
A_{90}	90 ± 5 of the upper range limit.

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Test atmospheres A_0, A_{20}, and A_{80} shall be consistent during the tests and from day to day.

(ii) For steps (xxv) through (xxxi) of this section, a chart speed of at least 10 centimeters per hour shall be used. The actual chart speed, chart speed changes, and time checks shall be clearly marked on the chart.

(iii) Allow sufficient time for test analyzer to warm up and stabilize at a line voltage of 115 volts and a room temperature of 25° C. Recalibrate, if necessary, and adjust the zero baseline to 5 percent of chart. No further adjustments shall be made to the analyzer until the end of the tests on the third day.

(iv) Measure test atmosphere A_0 until a stable reading is obtained, and record this reading (in ppm) as Z'_n, where $n=0$ (see Figure B-4 in Appendix A).

(v) Measure test atmosphere A_{20}. Allow for a stable reading and record it as M'_n, where $n=0$.

(vi) Measure test atmosphere A_{80}. Allow for a stable reading and record it as S'_n, where $n=0$.

(vii) The above readings for Z'_0, M'_0, and S'_0 should be taken at least four (4) hours prior to the beginning of test day 1.

(viii) At the beginning of each test day, adjust the line voltage and room temperature to the values given in Table B-4.

(ix) Measure test atmosphere A_0 continuously for at least twelve (12) continuous hours during each test day.

(x) After the 12-hour zero drift test (step ix), sample test atmosphere A_0. A stable reading is not required.

(xi) Measure test atmosphere A_{20} and record the stable reading (in ppm) as P_1. (See Figure B-4 in Appendix A.)

(xii) Sample test atmosphere A_{80}; a stable reading is not required.

(xiii) Measure test atmosphere A_{20} and record the stable reading as P_2.

(xiv) Sample test atmosphere A_0; a stable reading is not required.

(xv) Measure test atmosphere A_{20} and record the stable reading as P_3.

(xvi) Sample test atmosphere A_{80}; a stable reading is not required.

(xvii) Measure test atmosphere A_{20} and record the stable reading as P_4.

(xviii) Sample test atmosphere A_0; a stable reading is not required.

(xix) Measure test atmosphere A_{20} and record the stable reading as P_5.

(xx) Sample test atmosphere A_{80}; a stable reading is not required.

(xxi) Measure test atmosphere A_{20} and record the stable reading as P_6.

(xxii) Measure test atmosphere A_{80} and record the stable reading as P_7.

(xxiii) Sample test atmosphere A_{80}; a stable reading is not required.

(xxiv) Measure test atmosphere A_{80} and record the stable reading as P_8. Increase chart speed to at least 10 centimeters per hour.

(xxv) Measure test atmosphere A_0. Record the stable reading as L_1.

(xxvi) Quickly switch the test analyzer to measure test atmosphere A_{80} and mark the recorder chart to show the exact time when the switch occurred.

(xxvii) Measure test atmosphere A_{80} and record the stable reading as P_{80}.

(xxviii) Sample test atmosphere A_{80}; a stable reading is not required.

(xxix) Measure test atmosphere A_{80} and record the stable reading as P_{10}.

(xxx) Measure test atmosphere A_0 and record the stable reading as L_2.

(xxxi) Measure test atmosphere A_{80} and record the stable reading as P_{11}.

(xxxii) Sample test atmosphere A_{80}; a stable reading is not required.

(xxxiii) Measure test atmosphere A_{80} and record the stable reading as P_{12}.

(xxxiv) Repeat steps (viii) through (xxxiii) of this section, each test day.

(xxxv) If zero and span adjustments are made after the readings are taken on test days 3, 6, 9, or 12, complete all adjustments; then measure test atmospheres A_0, A_{80}, and A_{20}. Allow for a stable reading on each, and record the readings as Z'_n S'_n, and M_n respectively, where n=the test day number.

(10) Determine the results of each day's tests as follows. Mark the recorder chart to show readings and determinations.

(i) *Zero Drift.* (A) 12-hour. Examine the strip chart pertaining to the 12-hour continuous zero air test. Determine the minimum (Cmin.) and maximum (Cmax.) readings (in p/m) during this period of 12 consecutive hours, extrapolating the calibration curve to negative concentration units

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if necessary. Determine the 12-hour zero drift (12ZD) as $12ZD = C^{max} - C^{min}$. (See Figure B-5 in Appendix A.)

(B) Calculate the 24-hour zero drift (24*ZD*) for the *n*-th test day as $24ZD_n = Z_n - Z_{n-1}$, or $24ZD_n = Z_n - Z'_{n-1}$ if zero adjustment was made on the previous day, where $Z_n = \frac{1}{2}(L_1 + L_2)$ for L_1 and L_2 taken on the *n*-th test day.

(C) Compare 12 *ZD* and 24 *ZD* to the zero drift specification in Table B-1. Both 12 *ZD* and 24 *ZD* must be equal to or less than the specified value to pass the test for zero drift.

(ii) *Span Drift*

(A) Span drift at 20 percent of URL (MSD):

$$MSD_n = \frac{M_n - M_{n-1}}{M_{n-1}} \times 100\%$$

$$MSD_n = \frac{M_n - M'_{n-1}}{M'_{n-1}} \times 100\%$$

if span adjustment was made on the previous day, where

$$M_n = \frac{1}{6}\sum_{i=1}^{6} P_i$$

n indicates the *n*-th test day, and *i* indicates the *i*-th reading on the *n*th day.

(B) Span drift at 80 percent of URL (USD):

$$USD_n \quad \frac{S_n \quad S_{n-1}}{S_{n-1}} \cdot 100\%,$$

or

$$USD_n \quad \frac{S_n \quad S'_{n-1}}{S'_{n-1}} \cdot 100\%,$$

if span adjustment was made on the previous day, where

$$S_n = \frac{1}{6}\sum_{i=7}^{12} P_i$$

n indicates the *n*-th test day, and *i* indicates the *i*-th reading on the *n*-th test day.

(C) Both USD and MSD must be equal to or less than the respective specifications given in Table B-1 to pass the test for span draft.

(iii) *Lag Time.* Determine, from the strip chart, the elapsed time in minutes between the mark made in step (xxvi) and the first observable (two times the noise level) response. This time must be equal to or less than the time specified in Table B-1 to pass the test for lag time.

(iv) *Rise Time.* Calculate 95 percent of reading P_9 and determine from the recorder chart, the elapsed time between the first observable (two times noise level) response and a response equal to 95 percent of the P_9 reading. This time must be equal to or less than the rise time specified in Table B-1 to pass the test for rise time.

(v) *Fall Time.* Calculate five percent of $(P_{10} - L_2)$ and determine, from the strip chart, the elapsed time in minutes between the first observable decrease in response following reading P_{10} and a response equal to five percent of $(P_{10} - L_2)$. This time must be equal to or less than the fall time specification in Table B-1 to pass the test for fall time.

(vi) *Precision.* Calculate precision (P_{20} and P_{80}) for each day's test as follows:

(A)

$$P_{20} = \sqrt{\frac{1}{5}\left[\sum_{i=1}^{6} P_i^2 - \frac{1}{6}\left(\sum_{i=1}^{6} P_i\right)^2\right]}$$

(B)

$$P_{80} = \sqrt{\frac{1}{5}\left[\sum_{i=7}^{12} P_i^2 - \frac{1}{6}\left(\sum_{i=7}^{12} P_i\right)^2\right]}$$

(C) Both P_{20} and P_{80} must be equal to or less than the specification given in Table B-1 to pass the test for precision.

[40 FR 7049, Feb. 18, 1975, as amended at 41 FR 52694, Dec. 1, 1976]

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Appendix A—Optional Forms for Reporting Test Results

Table B-5. Symbols and Abbreviations

B_1	Analyzer reading at specified *LDL* concentration.
B_2	Analyzer reading at 0 concentration for *LDL* test.
DM	Digital meter.
C_{max}	Maximum analyzer reading during 12 *ZD* test.
C_{min}	Minimum analyzer reading during 12 *ZD* test.
i	Subscript indicating the *i*-th quantity in a series.
IE	Interference equivalent.
L_1	First analyzer zero reading for 24 *ZD* test.
L_2	Second analyzer zero reading for 24 *ZD* test.
M_n	Average of P_1 . . . P_6 for the *n*-th test day.
M'_n	Adjusted span reading at 20 percent of *URL* on the *n*-th test day.
MSD	Span drift at 20 percent of *URL*.
n	Subscript indicating the test day number.
P	Analyzer reading for precision test.
P_i	The *i*-th analyzer reading for precision test.
P_{20}	Precision at 20 percent of *URL*.
P_{80}	Precision at 80 percent of *URL*.
R	Analyzer reading of pollutant alone for *IE* test.
R_I	Analyzer reading with interferent added for *IE* test.
r_i	The *i*-th *DM* reading for noise test.
S	Standard deviation of noise readings.
S_0	Noise value (*S*) measured at 0 concentration.
S_{80}	Noise value (*S*) measured at 80 percent of *URL*.
S_n	Average of P_7 . . . P_{12} for the *n*-th test day.
S'_n	Adjusted span reading at 80 percent of *URL* on the *n*-th test day.
URL	Upper range limit.
USD	Span drift at 80 percent of *URL*.
Z	Average of L_1 and L_2.
Z_n	Average of L_1 and L_2 on the *n*-th test day.
Z'_n	Adjusted zero reading on the *n*-th test day.
ZD	Zero drift.
12*ZD*	12-hour zero drift.
24*ZD*	24-hour zero drift.

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Applicant _____ Date _____

Test No. _____

Analyzer _____ Range _____

READING NUMBER (i)	TIME	0% of URL		80% of URL	
		DM READING	r_i, ppm	DM READING	r_i, ppm
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
$\sum_{i=1}^{25} r_i$					
$\sum_{i=1}^{25} r_i^2$					
S			S_0 =		S_{80} =

Figure B-2 Form for noise data.

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Applicant _____

Analyzer _____ Range _____

TEST PARAMETER		READING OR CALCULATION	TEST NUMBER														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LOWER DETECTABLE LIMIT		B_Z															
		B_L															
		$LDL = B_L - B_Z$															
INTERFERENCE EQUIVALENT	1	R_1															
		R_{11}															
		$IE_1 = R_{11} - R_1$															
	2	R_2															
		R_{12}															
		$IE_2 = R_{12} - R_2$															
	3	R_3															
		R_{13}															
		$IE_3 = R_{13} - R_3$															
	4	R_4															
		R_{14}															
		$IE_4 = R_{14} - R_4$															
	5	R_5															
		R_{15}															
		$IE_5 = R_{15} - R_5$															
	TOTAL	$IE_T = \sum_{i=1}^{5} \lvert IE_i \rvert$															

Figure B-3. Form for data and calculations for lower detectable limit and interference equivalent.

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Applicant _____

Analyzer _____ Range _____

TEST DAY (n)	ANALYZER READING, ppm															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DATE																
P_1																
P_2																
P_3																
P_4																
P_5																
P_6																
$\sum_{i=1}^{6} P_i^2$																
P_7																
P_8																
P_9																
P_{10}																
P_{11}																
P_{12}																
$\sum_{i=7}^{12} P_i^2$																
L_1																
L_2																
Z_n'																
M_n'																
S_n'																
C_{max}																
C_{min}																

Figure B-4. Form recording data for drift and precision.

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Applicant _____

Analyzer _____ Range _____

TEST PARAMETER		CALCULATION	n - th TEST DAY														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Zero drift	12 hour	$12ZD = C_{max} - C_{min}$															
	24 hour	$Z = \frac{1}{4}(L_1 + L_2)$															
		$24ZD_n = Z_n - Z_{n-1}$															
		$24ZD_n = Z_n - Z'_{n-1}$															
Span drift	20% URL	$M_n = \frac{1}{6}\sum_{i=1}^{6} P_i$															
		$MSD_n = \frac{M_n - M_{n-1}}{M_{n-1}} \times 100\%$															
		$MSD_n = \frac{M_n - M'_{n-1}}{M'_{n-1}} \times 100\%$															
	80% URL	$S_n = \frac{1}{6}\sum_{i=7}^{12} P_i$															
		$USD_n = \frac{S_n - S_{n-1}}{S_{n-1}} \times 100\%$															
		$USD_n = \frac{S_n - S'_{n-1}}{S'_{n-1}} \times 100\%$															
Precision	20% URL	$P_{20} = \sqrt{\frac{1}{5}\left[\sum_{i=1}^{6} P_i^2 - \frac{1}{6}\left(\sum_{i=1}^{6} P_i\right)^2\right]}$															
	80% URL	$P_{80} = \sqrt{\frac{1}{5}\left[\sum_{i=7}^{12} P_i^2 - \frac{1}{6}\left(\sum_{i=7}^{12} P_i\right)^2\right]}$															

Figure B-5. Form for calculating zero drift, span drift and precision.

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Applicant _____ Analysis _____

Analyzer _____

_____ Range _____

PERFORMANCE PARAMETER		Table B-1 spec.	TEST 1	2	3	4	5	6	7	TEST 8	9	10	11	12	13	14	15	No. of test failures	Pass or fail
NOISE, ppm	0% URL (S_0)																		
	80% URL (S_{80})																		
LDL (must be 2 x noise[a])																			
INTERFERENCE EQUIVALENT, ppm	IE_1																		
	IE_2																		
	IE_3																		
	IE_4																		
	IE_5																		
	TOTAL (IE_T)																		
ZERO DRIFT, ppm	12 hour (12ZD)																		
	24 hour (24ZD)																		
SPAN DRIFT, %	20% URL (MSD)																		
	80% URL (USD)																		
LAG TIME, min																			
RISE TIME, min																			
FALL TIME, min																			
PRECISION, ppm	20% URL (P_{20})																		
	80% URL (P_{80})																		

[a]Compare each test LDL reading with the corresponding noise measurements. LDL reading must exceed the 0% URL noise value by a factor of 2 to pass the test for LDL.

Figure B-6. Form for summary of test results.

[40 FR 7049 Feb. 18, 1975, as amended at 40 FR 18169, Apr. 25, 1975]

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Subpart C—Procedures for Determining a Consistent Relationship Between Candidate Methods and Reference Methods

§ 53.30 General provisions.

(a) *Determination of Consistent Relationship.* The test procedures given in this subpart shall be used to determine if a candidate method has a consistent relationship to a reference method when both methods measure pollutant concentrations in a real atmosphere.

(1) A consistent relationship is shown for SO_2, CO, O_3, and NO_2 methods when the differences between: (i) Measurements made by a candidate manual method or by a test analyzer representative of a candidate automated method, and (ii) measurements made simultaneously by a reference method are less than or equal to the value specified in the last column of table C-1.

(2) A consistent relationship is shown for lead methods when the differences between: (i) Measurements made by a candidate method, and (ii) measurements made simultaneously by the reference method are less than or equal to the value specified in table C-3.

(b) *Selection of test sites*—(1) *All methods.* Each test site shall be in a predominately urban area which can be shown to have at least moderate concentrations of various pollutants. The site shall be clearly identified and shall be justified as an appropriate test site with suitable supporting evidence such as maps, population density data, vehicular traffic data, emission inventories, pollutant measurements from previous years, concurrent pollutant measurements, and wind or weather data. If desired, a request for approval of the test site or sites may be submitted prior to conducting the tests. The Administrator may in his discretion select a different site (or sites) for any additional tests he decides to conduct.

(2) *Methods for gaseous pollutants.* All test measurements are to be made at the same test site. If necessary, the concentration of pollutant in the sampled ambient air may be augmented with artificially generated pollutant to facilitate measurements in the specified ranges. (See paragraph (d)(2) of this section.)

(3) *Methods for lead.* Test measurements may be made at any number of test sites. Augmentation of pollutant concentrations is not permitted, hence an appropriate test site or sites must be selected to provide lead concentrations in the specified range. Test sites for lead measurements must be located near a heavily traveled roadway.

(c) *Test atmosphere.* Ambient air sampled at an appropriate test site shall be used for these tests. Simultaneous concentration measurements shall be made in each of the concentration ranges specified in table C-1 or table C-3.

(d) *Sample collection*—(1) *All methods.* All test concentration measurements or samples shall be taken in such a way that both the candidate method and the reference method receive air samples that are homogenous or as nearly identical as practical.

(2) *Methods for gaseous pollutants.* Ambient air shall be sampled from a common intake and distribution manifold designed to deliver homogenous air samples to both methods. Precautions shall be taken in thd design and construction of this manifold to minimize the removal of particulates and trace gases, and to insure that identical samples reach to two methods. If necessary, the concentration of pollutant in the sampled ambient air may be augmented with artificially generated pollutant. However, at all times the air sample measured by the candidate and reference methods under test shall consist of not less than 80 percent ambient air by volume. Schematic drawings, physical illustrations, descriptions, and complete details of the manifold system and the augmentation system (if used) shall be submitted.

(3) *Methods for lead.* The intake points of the candidate and reference samplers for lead shall be located at the same height, at the same distance from the source, and between 3 and 5 meters apart.

(4) *Methods employing a common sampling procedure.* Candidate methods which employ a sampler and

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sample collection procedure which are identical to the sampler and sample collection procedure specified in the reference method may be tested by analyzing common samples in accordance with the candidate and reference analysis procedures. The common samples are to be collected according to the sample collection procedure specified by the reference method, and must be divided such that identical portions are analyzed by the analysis procedures of the two methods.

(e) *Submission of test data and other information.* All recorder charts, calibration data, records, test results, procedural descriptions and details, and other documentation obtained from (or pertinent to) these tests shall be identified, dated, signed by the analyst performing the test, and submitted.

(Secs. 110, 301(a), Clean Air Act as amended (42 U.S.C. 7410, 7601))

[40 FR 7049, Feb. 18, 1975, as amended at 44 FR 37916, June 29, 1979]

§ 53.31 Test conditions.

(a) *All methods.* All test measurements made or test samples collected by means of a sample manifold as specified in § 53.30(d)(2) shall be at a room temperature between 20° and 30° C, and at a line voltage between 105 and 125 volts. All methods shall be calibrated as specified in paragraph (c) of this section prior to initiation of the tests.

(b) *Automated Methods.* Set-up and start-up of the test analyzer (and the reference method if automated) shall be in strict accordance with the applicable operation manual(s). If the test analyzer does not have an integral strip chart recorder, connect the analyzer output to a suitable strip chart recorder of the servo, null-balance type. This recorder shall have a chart width of at least 25 centimeters, a response time of 1 second or less, a deadband of not more than 0.25 percent of full scale, and capability of either reading measurements at least 5 percent below zero or offsetting the zero by at least 5 percent.

NOTE: Other data acquisition components may be used along with the chart recorder during the conduct of these tests. Use of the chart recorder is intended only to facilitate evaluation of data submitted.

Allow adequate warmup or stabilization time as indicated in the applicable operation manual(s) before beginning the tests.

(c) *Calibration.* The reference method shall be calibrated according to the appropriate appendix to Part 50 of this chapter (if it is a manual method) or according to the applicable operation manual(s) (if it is an automated method). A candidate manual method (or portion thereof) shall be calibrated if such calibration is a part of the method.

(d) *Range.* (1) Except as provided in paragraph (d)(2) of this section, each method shall be operated in the range specified for the reference method in the appropriate appendix to Part 50 (for manual reference methods), or specified in table B-1 of this part (for automated reference methods).

(2) For a candidate method having more than one selectable range, one range must be that specified in Table B-1 and a test analyzer representative of the method must pass the tests required by this subpart while operated in that range. The tests may be repeated for a broader range (i.e., one estanding to higher concentrations) than the one specified in Table B-1, provided that the range does not extend to concentrations more than two times the upper range limit specified in Table B-1 and that the test analyzer has passed the tests required by Subpart B of this part (if applicable) for the broader range. If the tests required by this subpart are conducted or passed only for the range specified in Table B-1, any equivalent method determination with respect to the method will be limited to that range. If the tests are passed for both the specified range and a broader range (or ranges), any such determination will include the broader range(s) as well as the specified range. Appropriate test data shall be submitted for each range sought to be included in such a determination.

(e) *Operation of Automated Methods.* (1) Once the test analyzer has been set up and calibrated and tests started, manual adjustment or normal periodic

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maintenance is permitted only every 3 days. Automatic adjustments which the test analyzer performs by itself are permitted at any time. At 3-day intervals only adjustments and periodic maintenance as specified in the manual referred to in § 53.4(b)(3) are permitted. The submitted records shall show clearly when manual adjustments were made and describe the operations performed.

(2) All test measurements shall be made with the same test analyzer; use of multiple test analyzers is not permitted. The test analyzer shall be operated continuously during the entire series of test measurements.

(3) If a test analyzer should malfunction during any of these tests, the entire set of measurements shall be repeated, and a detailed explanation of the malfunction, remedial action taken, and whether recalibration was necessary (along with all pertinent records and charts) shall be submitted.

(Secs. 110, 301(a), Clean Air Act as amended (42 U.S.C. 7410, 7601))

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18169, Apr. 25, 1975; 44 FR 37917, June 29, 1979]

§ 53.32 Test procedures for gaseous pollutants.

(a) Conduct the first set of simultaneous measurements with the candidate and reference methods:

(1) Table C-1 specifies the type (1- or 24-hour) and number of measurements to be made in each of the three test concentration ranges.

(2) The pollutant concentration must fall within the specified range as measured by the reference method.

(3) The measurements shall be made in the sequence specified in Table C-2, except for the 1-hour SO_2 measurements, which are all in the high range.

(b) For each pair of measurements, determine the difference (discrepancy) between the candidate method measurement and reference method measurement. A discrepancy which exceeds the discrepancy specified in Table C-1 constitutes a failure. (See Figure C-1 in Appendix A for a suggested format for reporting the test results).

(c) The results of the first set of measurements shall be interpreted as follows:

(1) Zero (0) failures: The candidate method passes the test for consistent relationship.

(2) Three (3) or more failures: The candidate method fails the test for consistent relationship.

(3) One (1) or two (2) failures: Conduct a second set of simultaneous measurements as specified in Table C-1. The results of the combined total of first-set and second-set measurements shall be interpreted as follows:

(i) One (1) or two (2) failures: The candidate method passes the test for consistent relationship.

(ii) Three (3) or more failures: The candidate method fails the test for consistent relationship.

(4) For sulfur dioxide, the 1-hour and 24-hour measurements shall be interpreted separately, and the candidate method must pass the tests for both 1-and 24-hour measurements to pass the test for consistent relationship.

(d) A 1-hour measurement consists of the integral of the instantaneous concentration over a 60-minute continuous period divided by the time period. Integration of the instantaneous concentration may be performed by any appropriate means such as chemical, electronic, mechanical, visual judgment, or by calculating the mean of not less than 12 equally spaced instantaneous readings. Appropriate allowances or corrections shall be made in cases where significant errors could occur due to characteristic lag time or rise/fall-time differences between the candidate and reference methods. Details of the means of integration and any corrections shall be submitted.

(e) A 24-hour measurement consists of the integral of the instantaneous concentration over a 24-hour continuous period divided by the time period. This integration may be performed by any appropriate means such as chemical, electronic, mechanical, or by calculating the mean of twenty-four (24) sequential 1-hour measurements.

(f) For oxidant and carbon monoxide, no more than six (6) 1-hour measurements shall be made per day. For

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sulfur dioxide, no more than four (4) 1-hour measurements or one (1) 24-hour measurement shall be made per day. One-hour measurements may be made concurrently with 24-hour measurements if appropriate.

(g) For applicable methods, control or calibration checks may be performed once per day without adjusting the test analyzer or method. These checks may be used as a basis for a linear interpolation-type correction to be applied to the measurements to correct for drift. If such a correction is used, it shall be applied to all measurements made with the method, and the correction procedure shall become a part of the method.

TABLE C-1.—TEST CONCENTRATION RANGES, NUMBER OF MEASUREMENTS REQUIRED, AND MAXIMUM DISCREPANCY SPECIFICATION

Pollutant	Concentration range, parts per million	Simultaneous measurements required				Maximum discrepancy specification, parts per million
		1-hr		24-hr		
		First set	Second set	First set	Second set	
Oxidants	Low 0.06 to 0.10	5	6			0.02
	Med 0.15 to 0.25	5	6			.03
	High 0.35 to 0.45	4	6			.04
Total		14	18			
Carbon monoxide	Low 7 to 11	5	6			1.5
	Med 20 to 30	5	6			2.0
	High 35 to 45	4	6			3.0
Total		14	18			
Sulfur dioxide	Low 0.02 to 0.05			3	3	0.02
	Med 0.10 to 0.15			2	3	.03
	High 0.30 to 0.50	7	8	2	2	.04
Total		7	8	7	8	
Nitrogen dioxide	Low 0.02 to 0.08			3	3	0.02
	Med 0.10 to 0.20			2	3	.02
	High 0.25 to 0.35			2	2	.03
Total				7	8	

TABLE C-2—SEQUENCE OF TEST MEASUREMENTS

Measurement	Concentration range	
	First set	Second set
1	Low	Medium.
2	High	High.
3	Medium	Low.
4	High	High.
5	Low	Medium.
6	Medium	Low.
7	Low	Medium.
8	Medium	Low.
9	High	High.
10	Medium	Low.
11	High	Medium.
12	Low	High.
13	Medium	Medium.
14	Low	High.
15		Low.
16		Medium.
17		Low.
18		High.

(Secs. 110, 301(a), Clean Air Act as amended (42 U.S.C. 7410, 7601))

[40 FR 7049, Feb. 18, 1975, as amended at 41 FR 52693, Dec. 12, 1976; 44 FR 37917, June 29, 1979]

§ 53.33 Test procedure for lead methods.

(a) *Sample collection.* Collect simultaneous 24-hour samples (filters) of lead at the test site or sites with both the reference and candidate methods until at least 10 filter pairs have been obtained. If the conditions of § 53.30(d)(4) apply, collect at least 10 common samples (filters) in accordance with § 53.30(d)(4) and divide each to form the filter pairs.

(b) *Audit samples.* Three audit samples must be obtained from the Director, Environmental Monitoring and Support Laboratory, Department E, U.S. Environmental Protection

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Agency, Research Triangle Park, N.C. 27711. The audit samples are ¾ × 8-inch glass fiber strips containing known amounts of lead at the following nominal levels: 100 μg/strip; 300 μg/strip; 750 μg/strip. The true amount of lead in total μg/strip will be provided with each audit sample.

(c) *Filter analysis.* (1) For both the reference method and the audit samples, analyze each filter extract 3 times in accordance with the reference method analytical procedure. The analysis of replicates should not be performed sequentially (i.e., and single sample should not be analyzed three times in sequence). Calculate the indicated lead concentratons for the reference method samples in μg/m³ for each analysis of each filter. Calculate the indicated total lead amount for the audit samples in μg/strip for each analysis of each strip. Label these test results as R_{1A}, R_{1B}, R_{1C}, R_{2A}, R_{2B}, . . ., Q_{1A}, Q_{1B}, $_{1C}$, ..., where R denotes results from the reference method samples; Q denotes results from the audit samples; 1, 2, 3 indicates filter number and A, B, C indicates the first, second, and third analysis of each filter, respectively.

(2) For the candidate method samples, analyze each sample filter or filter extract three times and calculate, in accordance with the candidate method, the indicated lead concentration in μg/m³ for each analysis of each filter. Label these test results as C_{1A}, C_{1B}, C_{2C}, . . ., where C denotes results from the candidate method. (For candidate methods which provide a direct measurement of lead concentrates without a separable procedure, $C_{1A}=C_{1B}=C_{1C}$, $C_{2A}=C_{2B}=C_{2C}$, etc.)

(d) For the reference method, calculate the average lead concentration for each filter by averaging the concentrations calculated from the three analyses:

$$R_{i\,ave} = \frac{R_{iA} + R_{iB} + R_{iC}}{3},$$

where i is the filter number.

(e) Disregard all filter pairs for which the lead concentration as determined in the previous paragraph (d) by the average of the three reference method determinations, falls outside the range of 0.5 to 4.0 μg/m³. All remaining filter pairs must be subjected to both of the following tests for precision and consistent relationship. At least five filter pairs must be within the 0.5 to 4.0 μg/m³ range for the tests to be valid.

(f) *Test for precision.* (1) Calculate the precision (P) of the analysis (in percent) for each filter and for each method, as the maximum minus the minimum divided by the average of the three concentration values, as follows:

$$P_{Ri} = \frac{R_{i\,max} - R_{i\,min}}{R_{i\,ave}} \times 100\%,$$

or

$$P_{Ci} = \frac{C_{i\,max} - C_{i\,min}}{C_{i\,ave}} \times 100\%,$$

where i indicates the filter number.

(2) If any reference method precision value (P_{Ri}) exceeds 15 percent, the precision of the reference method analytical procedure is out of control. Corrective action must be taken to determine the source(s) of imprecision and the reference method determinations must be repeated according to paragraph (c) of this section, or the entire test procedure (starting with paragraph (a)) must be repeated.

(3) If any candidate method precision value (P_{Ci}) exceeds 15 percent, the candidate method fails the precision test.

(4) The candidate method passes this test if all precision values (i.e., all P_{Ri}'s and all P_{Ci}'s) are less than 15 percent.

(g) *Test for accuracy.* (1) For the audit samples calculate the average lead concentration for each strip by averaging the concentrations calculated from the three analyses:

$$Q_{i\,ave} = \frac{Q_{iA} + Q_{iB} + Q_{iC}}{3},$$

where i is audit sample number.

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Calculate the percent difference (D_q) between the indicated lead concentration for each audit sample and the true lead concentration (T_q) as follows:

$$D_{qi} = \frac{Q_{i\ ave} - T_{qi}}{T_{qi}} \times 100$$

(2) If any difference value (D_{qi}) exceeds ±5 percent the accuracy of the reference method analytical procedure is out of control. Corrective action must be taken to determine the source of the error(s) (e.g., calibration standard discrepancies, extraction problems, etc.) and the reference method and audit sample determinations must be repeated according to paragraph (c) of this section or the entire test precedure (starting with paragraph (a)) must be repeated.

(h) *Test for consistent relationship.* (1) For each filter pair, calculate all nine possible percent differences (D) between the reference and candidate methods, using all nine possible combinations of the three determinations (A, B, and C) for each method, as:

$$D_{in} = \frac{C_{ij} - R_{ik}}{R_{ik}} \times 100\%,$$

where

i is the filter number, and n

numbers from 1 to 9 for the nine possible difference combinations for the three determinations for each method (j= A, B, C, candidate; k= A, B, C, reference).

(2) If none of the percent differences (D) exceeds ±20 percent, the candidate method passes the test.

(3) If one or more differences (D) exceeds ±20 percent, the candidate method fails the test for consistent relationship.

(i) The candidate method must pass both the precision test and the consistent relationship test to qualify for designation as an equivalent method.

TABLE C-3—TEST SPECIFICATIONS FOR LEAD METHODS

Concentration range, μg/m³	0.5–4.0
Minimum number of 24-hr measurements	5
Maximum analytical precision, percent	15
Maximum analytical accuracy, percent	±5
Maximum difference, percent of reference method	±20

(Secs. 110, 301(a), Clean Air Act is amended (42 U.S.C. 7410, 7601))

[44 FR 37917, June 29, 1979]

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Candidate Method _____

Reference Method _____

Applicant _____ Pollutant _____

☐ First Set ☐ Second Set ☐ Type ☐ 1 hour ☐ 24 hour

CONCENTRATION RANGE		DATE	TIME	CONCENTRATION, ppm		DIFFERENCE	TABLE C-1 SPEC.	PASS OR FAIL
				CANDIDATE	REFERENCE			
LOW _____ ppm to _____ ppm	1							
	2							
	3							
	4							
	5							
	6							
MEDIUM _____ ppm to _____ ppm	1							
	2							
	3							
	4							
	5							
	6							
HIGH _____ ppm to _____ ppm	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
						TOTAL FAILURES:		

Figure C 1. Form for Subpart C test results.

[40 FR 7049 Feb. 18, 1975, as amended at 40 FR 18169, Apr. 25, 1975]

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PART 54—PRIOR NOTICE OF CITIZEN SUITS

Sec.
54.1 Purpose.
54.2 Service of notice.
54.3 Contents of notice.

AUTHORITY: Sec. 304 of the Clean Air Act, as amended (sec. 12, Pub. L. 91-604, 84 Stat. 1706).

SOURCE: 36 FR 23386, Dec. 9, 1971, unless otherwise noted.

§ 54.1 Purpose.

Section 304 of the Clean Air Act, as amended, authorizes the commencement of civil actions to enforce the Act or to enforce certain requirements promulgated pursuant to the Act. The purpose of this part is to prescribe procedures governing the giving of notices required by subsection 304(b) of the Act (sec. 12, Pub. L. 91-604; 84 Stat. 1706) as a prerequisite to the commencement of such actions.

§ 54.2 Service of notice.

(a) Notice to Administrator: Service of notice given to the Administrator under this part shall be accomplished by certified mail addressed to the Administrator, Environmental Protection Agency, Washington, D.C. 20460. Where notice relates to violation of an emission standard or limitation or to violation of an order issued with respect to an emission standard or limitation, a copy of such notice shall be mailed to the Regional Administrator of the Environmental Protection Agency for the Region in which such violation is alleged to have occurred.

(b) Notice to State: Service of notice given to a State under this part regarding violation of an emission standard or limitation, or an order issued with respect to an emission standard or limitation shall be accomplished by certified mail addressed to an authorized representative of the State agency charged with responsibility for air pollution control in the State. A copy of such notice shall be mailed to the Governor of the State.

(c) Notice to alleged violator: Service of notice given to an alleged violator under this part shall be accomplished by certified mail addressed to, or by personal service upon, the owner or managing agent of the building, plant, installation, or facility alleged to be in violation of an emission standard or limitation, or an order issued with respect to an emission standard or limitation. Where the alleged violator is a corporation, a copy of such notice shall be sent by certified mail to the registered agent, if any, of such corporation in the State in which such violation is alleged to have occurred.

(d) Notice served in accordance with the provisions of this part shall be deemed given on the postmark date, if served by mail, or on the date of receipt, if personally served.

§ 54.3 Contents of notice.

(a) *Failure to act.* Notice regarding a failure of the Administrator to perform an act or duty which is not discretionary shall identify the provisions of the Act which requires such act or creates such duty, shall describe with reasonable specificity the action taken or not taken by the Administrator which is claimed to constitute a failure to perform such act or duty, and shall state the full name and address of the person giving the notice.

(b) *Violation of standard, limitation or order.* Notices to the Administrator, States, and alleged violators regarding violation of an emission standard or limitation or an order issued with respect to an emission standard or limitation, shall include sufficient information to permit the recipient to identify the specific standard, limitation, or order which has allegedly been violated, the activity alleged to be in violation, the person or persons responsible for the alleged violation, the location of the alleged violation, the date or dates of such violation, and the full name and address of the person giving the notice.

PART 55—ENERGY RELATED AUTHORITY

Subpart A—General Provisions

Sec.
55.01 Applicability.
55.02 Definitions.
55.03 Address.

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Sec.
55.04 Compliance date extensions.
55.05 Temporary suspensions.
55.06 Sources ordered to burn coal which are not eligible to apply for either a compliance date extension or a temporary suspension.
55.07 Petitions by air pollution control agencies.
55.08 One year postponement for power plant shutdown.
55.09 General requirements.

Subpart B—Alabama

55.50—55.69 [Reserved]

Subpart C—Alaska

55.70—55.89 [Reserved]

Subpart D—Arizona

55.90—55.109 [Reserved]

Subpart E—Arkansas

55.110—55.129 [Reserved]

Subpart F—California

55.130—55.149 [Reserved]

Subpart G—Colorado

55.150—55.169 [Reserved]

Subpart H—Connecticut

55.170—55.189 [Reserved]

Subpart I—Delaware

55.190 Delayed compliance order.
55.191—55.209 [Reserved]

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55.210—55.229 [Reserved]

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55.230 Federal delayed compliance orders issued under section 113(d)(5) of the Act.
55.231—55.249 [Reserved]

Subpart L—Georgia

55.250 Compliance date extensions.
55.251—55.269 [Reserved]

Subpart M—Hawaii

55.270—55.289 [Reserved]

Subpart N—Idaho

55.290—55.309 [Reserved]

Subpart O—Illinois

Sec.
§ 55.310 Federal administrative orders issued under Section 113(d)(5) of the Act.
§§ 55.311—55.329 [Reserved]

Subpart P—Indiana

55.330—55.349 [Reserved]

Subpart Q—Iowa

55.350 Compliance date extension.
55.351 Compliance date extension.
55.352—55.369 [Reserved]

Subpart R—Kansas

55.370 Compliance date extension.
55.371 Compliance date extension.
55.372 Compliance date extension.
55.373—55.389 [Reserved]

Subpart S—Kentucky

55.390—55.409 [Reserved]

Subpart T—Louisiana

55.410—55.429 [Reserved]

Subpart U—Maine

55.430—55.449 [Reserved]

Subpart V—Maryland

55.450 Delayed compliance order.

Subpart W—Massachusetts

55.470 Delayed compliance order.
55.471 Federal administrative orders issued under Section 113(d)(5) of the Act.
55.472 Federal administrative orders issued under Section 113(d)(5) of the Act.
55.473—55.489 [Reserved]

Subpart X—Michigan

55.490—55.509 [Reserved]

Subpart Y—Minnesota

55.510—55.529 [Reserved]

Subpart Z—Mississippi

55.530—55.549 [Reserved]

Subpart AA—Missouri

55.550 Compliance date extension.
55.551 Compliance date extension.
55.552—55.569 [Reserved]

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Subpart BB—Montana

Sec.
55.570—55.589 [Reserved]

Subpart CC—Nebraska

55.590—55.609 [Reserved]

Subpart DD—Nevada

55.610—55.629 [Reserved]

Subpart EE—New Hampshire

55.630—55.649 [Reserved]

Subpart FF—New Jersey

55.650 Delayed compliance order.
55.651—55.669 [Reserved]

Subpart GG—New Mexico

55.670—55.689 [Reserved]

Subpart HH—New York

55.690—55.709 [Reserved]

Subpart II—North Carolina

55.710 Compliance date extensions.
55.711—55.729 [Reserved]

Subpart JJ—North Dakota

55.730—55.749 [Reserved]

Subpart KK—Ohio

55.750—55.769 [Reserved]

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55.770—55.789 [Reserved]

Subpart MM—Oregon

55.790—55.809 [Reserved]

Subpart NN—Pennsylvania

55.810—55.829 [Reserved]

Subpart OO—Rhode Island

55.830—55.849 [Reserved]

Subpart PP—South Carolina

55.850—55.869 [Reserved]

Subpart QQ—South Dakota

55.870—55.889 [Reserved]

Subpart RR—Tennessee

55.890—55.909 [Reserved]

Subpart SS—Texas

Sec.
55.910—55.929 [Reserved]

Subpart TT—Utah

55.930—55.949 [Reserved]

Subpart UU—Vermont

55.950—55.969 [Reserved]

Subpart VV—Virginia

55.970 Delayed compliance order.
55.971 Delayed compliance order.
55.972 Delayed compliance order.
55.973—55.989 [Reserved]

Subpart WW—Washington

55.990—55.1009 [Reserved]

Subpart XX—West Virginia

55.1010—55.1029 [Reserved]

Subpart YY—Wisconsin

55.1030—55.1049 [Reserved]

Subpart ZZ—Wyoming

55.1050—55.1069 [Reserved]

AUTHORITY: Secs. 113, 114, 119, and 301, Clean Air Act (42 U.S.C. 1857 et seq.), as amended, Pub. L. 91-604, 84 Stat. 1676, and Pub. L. 93-319, 88 Stat. 246, unless otherwise noted.

SOURCE: 40 FR 18440, Apr. 28, 1975, unless otherwise noted. Redesignated at 44 FR 72593, Dec. 14, 1979.

Subpart A—General Provisions

§ 55.01 Applicability.

(a) The provisions of this part apply to:

(1) Any fuel-burning stationary source which is eligible to apply for a compliance date extension.

(2) Any person to whom a stationary source fuel or emission limitation applies and who is eligible for a temporary suspension of such limitation.

(3) Any electric generating power plant which is eligible to apply, under section 119(i) of the Act, for a one-year postponement of any requirement of an applicable implementation plan, and

(4) Any fuel burning stationary source which is issued an order by the

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Administrator of the Federal Energy Administration under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974 (Pub. L. 93-319, 88 Stat. 246).

(b) The Administrator shall issue a compliance date extension to any fuel burning stationary source: (1) Which is eligible to apply for a compliance date extension because:

(i) Such source is prohibited from using petroleum products or natural gas by reason of an order which is issued under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974 or such source began conversion as defined in § 55.04(b) to the use of coal as its primary energy source during the period beginning on September 15, 1973, and ending on March 15, 1974; and

(ii) Such source, on or after September 15, 1973, converts to the use of coal as its primary energy source;

(2) Which the Administrator finds will not be able to burn coal (which is available to such source) in compliance with all applicable air pollution requirements without a compliance date extension;

(3) Which the Administrator finds will be able during the period of the compliance date extension to comply with all primary standard conditions applicable to such source, and with any regional limitation if applicable to such source; and

(4) Which has submitted to the Administrator a plan for compliance for such source which the Administrator has approved.

(c) The Administrator may, for any period beginning on or after June 22, 1974, and ending on or before June 30, 1975, temporarily suspend any stationary source fuel or emission limitation as it applies to any person:

(1) If the Administrator finds that such person will be unable to comply with any such limitation during such period solely because of unavailability of types or amounts of fuels (unless such unavailability results from an order under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974), or

(2) If such person is a source which is described in paragraphs (b)(1) and (2) of this section and the Administrator finds that the source will be able to comply during the period of the suspension with all primary standard conditions which will be applicable to such source.

[40 FR 18440, Apr. 28, 1975, as amended at 40 FR 58645, Dec. 18, 1975]

§ 55.02 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Act" means the Clean Air Act (42 U.S.C. 1857, et seq., as amended by Pub. L. 91-604, 84 Stat. 1676, and Pub. L. 93-319, 88 Stat. 246).

(b) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(c) "Stationary source" or "source" means any building, structure, facility, or installation which emits or may emit any air pollutant, including any person who owns, leases, operates, controls, or supervises any such building, structure, facility, or installation.

(d) "Primary standard condition" means an emission limitation, requirement respecting pollution characteristics of coal or any other enforceable measure for control of emissions prescribed by the Administrator (after consultation with appropriate States) for each source to which a suspension under § 55.01(c)(2) will apply, and for each source to which a compliance date extension under § 55.01(b) will apply, for the purpose of assuring (throughout the period that the suspension or extension will be in effect) that the burning of coal by such source will not result in emissions which cause or contribute to concentrations of any air pollutant in excess of any national primary ambient air quality standard for such pollutant.

(e) "Regional limitation" means the requirement that a source which is located in an air quality control region in which a national primary ambient air quality standard for an air pollutant is being exceeded in that region, may not emit such pollutant in amounts which exceed any emission limitation (and may not violate any other requirement) which applies to

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such source, under the applicable implementation plan for such pollutant.

(f) "Coal" means coal or coal derivatives.

(g) "Air pollution requirement" means any emission limitation, schedule or timetable for compliance, or other requirement, which is prescribed under any Federal, State, or local law or regulation, including the Act (except for any requirement prescribed under section 119(c) or (d), section 110(a)(2)(F)(v), or section 303 of the Act), and which limits stationary source emissions resulting from combustion of fuels (including a prohibition on, or specification of, the use of any fuel of any type, grade, or pollution characteristic).

(h) "Stationary source fuel or emission limitation" means any emission limitation, schedule or timetable of compliance, or other requirement, which is prescribed under the Act (other than section 119, section 111(b), section 112 or section 303 of the Act) or contained in any applicable implementation plan (other than a requirement imposed pursuant to section 110(a)(2)(F)(v) of the Act), and which limits, or is designed to limit, stationary source emissions resulting from combustion of fuels, including a prohibition on, or specification of, the use of any fuel of any type, grade or pollution characteristic.

(i) "Person" includes (in addition to the meaning given that term in section 302(e) of the Act) a fuel supplier.

(j) "Converts to the use of coal as its primary energy source" means to convert from the use of more than 50 percent heat input from petroleum products or natural gas over the two year period ending on September 15, 1973, to the use of coal as a primary energy source as defined by 10 CFR 303.2.

[40 FR 18440, Apr. 28, 1975, as amended at 40 FR 58645, Dec. 18, 1975]

§ 55.03 Address.

All requests, reports, applications, submittals, and other communications to the Administrator pursuant to this part shall be submitted in duplicate and addressed to the appropriate regional office of the Environmental Protection Agency, to the attention of the Director, Enforcement Division. The regional offices are as follows:

Region I (Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, Vermont), John F. Kennedy Federal Building, Boston, Massachusetts 02203.

Region II (New York, New Jersey, Puerto Rico, Virgin Islands), Federal Office Building, 26 Federal Plaza (Foley Square), New York, N.Y. 10007.

Region III (Delaware, District of Columbia, Pennsylvania, Maryland, Virginia, West Virginia), Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

Region IV (Alabama, Florida, Georgia, Mississippi, Kentucky, North Carolina, South Carolina, Tennessee), Suite 300, 1421 Peachtree Street, Atlanta, Georgia 30309.

Region V (Illinois, Indiana, Minnesota, Michigan, Ohio, Wisconsin), Federal Building, 230 South Dearborn, Chicago, Illinois 60604.

Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, Texas), 1600 Patterson Street, Dallas, Texas 75201.

Region VII (Iowa, Kansas, Missouri, Nebraska), 1735 Baltimore Street, Kansas City, Missouri 64108.

Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming), 916 Lincoln Towers, 1860 Lincoln Street, Denver, Colorado 80203.

Region IX (Arizona, California, Hawaii, Nevada, Guam, American Samoa), 100 California Street, San Francisco, California 94111.

Region X (Washington, Oregon, Idaho, Alaska), 1200 Sixth Avenue, Seattle, Washington 98101.

§ 55.04 Compliance date extensions.

(a) Any source which is eligible to apply for a compliance date extension under § 55.01(b)(1)(i) shall submit within 90 days after such source becomes eligible because of an order issued under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974, if such source is issued an order after the effective date of these regulations, or within 90 days after the effective date of these regulations if such source is issued an order prior to the effective date of these regulations (subject to the provisions of paragraphs (j) and (k) of this section), to the Administrator the following:

(1) If the source is not applying for a compliance date extension because it is able to burn coal in compliance with

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all applicable air pollution requirements without a compliance date extension:

(i) A listing of all applicable State and local air pollution requirements together with a certification of the date that the source will be able to burn coal and comply with each applicable air pollution requirement without a compliance date extension, and

(ii) If not now in compliance, a plan for compliance which includes a description of and incremental dates for taking the steps necessary to comply by the date specified in paragraph (a)(1)(i) of this section;

(2) If the source is unable to burn coal in compliance with all applicable air pollution requirements without a compliance date extension, either:

(i) A plan for compliance which includes as a minimum:

(A) The date by which the source will submit contracts (or other obligations enforceable against such source) referred to in paragraphs (a)(2)(i)(B) of this section.

(B) The date by which the source will enter into (or has entered into, if entered into before June 22, 1974) contracts (or other obligations enforceable against such source) to provide for obtaining a long-term supply of coal which enables such source to achieve the emission reduction required by paragraph (a)(2)(i)(E) of this section,

(C) The date by which on-site construction or installation of process modifications, if necessary, will be initiated,

(D) The date by which on-site construction or installation of necessary process modifications is to be completed,

(E) The date (which is as soon as practicable but not later than December 31, 1978) by which the source will be in compliance with each air pollution requirement (except those prescribed by any State or local law or regulation which is not a part of the applicable implementation plan) which was in effect on the date of submittal of this compliance schedule (or if there is no air pollution requirement in effect under the applicable implementation plan on such date, then the first air pollution requirement which takes effect under the applicable implementation plan after such date),

(F) A provision by which the source agrees to notify the Administrator in writing no later than ten days after each requirement, specified under paragraphs (a)(2)(i) (B), (C), (D) and (E) of this section, has been satisfied, and

(G) A provision by which the source agrees to take steps, when deemed necessary by the Administrator, to prevent imminent and substantial endangerment to the health of persons; or

(ii) A plan for compliance which includes as a minimum:

(A) The date by which the source will submit contracts (or other obligations enforceable against such source) referred to in paragraph (a)(2)(ii)(B) of this section,

(B) The date by which the source will enter into (or has entered into, if entered into before June 22, 1974) contracts (or other obligations enforceable against such source) to provide for a long-term supply of coal and continuous emission reduction systems necessary to permit the source to burn such coal and achieve the degree of emission reduction required by paragraph (a)(2)(ii)(E) of this section.

(C) The date by which on-site construction or installation of continuous emission reduction systems will be initiated,

(D) The date by which on-site construction or installation of continuous emission reduction systems is to be completed,

(E) The date (which is as soon as practicable, but not later than December 31, 1978; except that, in the case of a source for which a continuous emission reduction system is required for sulfur-related emissions, the date which is as soon as practicable, unless otherwise specified by the Administrator, but not later than January 1, 1979) by which the source will be in compliance with each air pollution requirement (except those prescribed by any State or local law or regulation which is not a part of the applicable implementation plan) which was in effect on the date of submittal of this compliance schedule (or if there is no air pollution requirement in effect under the applicable implementation

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plan on such date, then the first air pollution requirement which takes effect under the applicable implementation plan after such date),

(F) A provision by which the source agrees to notify the Administrator in writing, no later than ten days after each requirement, specified under paragraphs (a)(2)(ii) (B), (C), (D), and (E) of this section, has been satisfied, and

(G) A provision by which the source agrees to take steps, when deemed necessary by the Administrator, to prevent imminent and substantial endangerment to the health of persons;

(3) If the source is eligible to apply for a compliance date extension for any State or local law or regulation which is not a part of the applicable implementation plan and is unable to burn coal in compliance with such air pollution requirements without a compliance date extension, a plan for compliance which includes a description of any incremental dates for taking the steps necessary to comply with such State or local law or regulation;

(4) If the source is unable to burn coal in compliance with all applicable air pollution requirements without a compliance date extension, process and emissions data for purposes of determining any necessary primary standard conditions including as a minimum:

(i) For those sources which are required to submit to the Federal Power Commission the FPC Form 67 and Form 423:

(A) Verification of all data listed on the FPC Form 67 and Form 423 which are accurate,

(B) Correction of all data on the FPC Form 67 and Form 423 which are inaccurate and inclusion of any missing data,

(C) Notification of pending removal from service of any unit or units prior to January 1, 1980,

(D) Notification of proposed completion and startup of any new unit or units prior to January 1, 1979,

(E) For each new unit, projected operating and design data as required in Part I of the FPC Form 67,

(F) Listing of expected changes in average operating conditions and seasonal cycle of load use resulting from conversion to use of coal as the source's primary energy source, and

(G) Specification of the location of the source giving coordinates in the Universal Transverse Mercator System (UTMS), or longitude and latitude coordinates; or

(ii) For all sources except those identified in paragraph (a)(4)(i) of this section:

(A) Completion of all applicable sections of OMB Form 158-R75, "Air Pollutant Emissions Report", which can be obtained at the addresses listed in § 55.03, including:

(*1*) In section I, the source location in UTMS or latitude-longitude coordinates,

(*2*) In sections II, V, and VI, required information on the source both prior to conversion to coal, and as projected after conversion to coal, and

(*3*) In all sections, all available data for projected new units,

(B) Notification of pending removal from service of any unit or units prior to January 1, 1980, and

(C) Notification of proposed completion and startup of any new unit or units prior to January 1, 1979;

(5) If the source is unable to burn coal in compliance with all applicable air pollution requirements without a compliance date extension, a showing that the source is not able to burn coal which is available to such source in compliance with all applicable air pollution requirements;

(b) Any source which is eligible and which chooses to apply for a compliance date extension under § 55.01(b)(1)(ii) must apply by submitting, within 90 days after the effective date of these regulations (subject to the provisions of paragraphs (j) and (k) of this section), to the Administrator the same information as is required under paragraphs (a)(2), (3), (4), and (5) of this section along with evidence to support a determination by the Administrator that such source began conversion to the use of coal as its primary energy source during the period beginning on September 15, 1973, and ending on March 15, 1974. A source began conversion if:

(1) During the period beginning on September 15, 1973, and ending on

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March 15, 1974, the source took affirmative action to convert, such as:

(i) Entering a long-term contract binding on such source for obtaining coal; or

(ii) Entering a contract binding on such source for obtaining equipment or facilities to enable such source to use coal as its primary energy supply on a permanent basis; or

(iii) Expending sums in amounts necessary to undertake a complete and permanent conversion to coal; or

(iv) Formal application to the proper legal authorities for a variance from applicable implementation plan requirements to enable such source to burn coal; and

(2) The Administrator finds that the action taken under paragraph (b)(1) of this section evidences:

(i) A decision made prior to March 15, 1974, to convert to coal as a result of the unavailability of an adequate supply of fuels required for compliance with the applicable implementation plan; and

(ii) A good faith effort to expeditiously carry out such decision.

(c) The contracts or obligations referred to in paragraphs (a)(2)(i)(B) and (a)(2)(ii)(B) of this section, which are required to be submitted under paragraphs (a) and (b) of this section, shall be submitted to the Administrator for his approval before they become effective except that a contract or obligation which became effective before June 22, 1974, shall be submitted for approval after it became effective.

(1) A contract (or other obligation enforceable against such source) to provide for obtaining a long-term supply of coal shall include, as a minimum, the following:

(i) Unless specifically waived by the Administrator upon timely application by the source, provisions which reasonably insure performance by the supplier despite fluctuation in coal prices and other changes in market conditions (for example: Reasonable price escalation clauses, requirements for performance bonds, commitments to subject price disputes to arbitration, provision for liquidated damages, provision for alternative performance by delivery of conforming coal produced by other suppliers, or other incentives or disincentives);

(ii) A description (including the average sulfur, ash, and heat content, and the limits of expected variations) of the grade and quality of the coal to be supplied which shall be sufficient to permit the Administrator to determine that the burning of such coal, together with the use of any other emission reduction measures to be specified in the compliance schedule, would enable the source to achieve the emission reduction required by paragraph (a)(2)(i)(E) or (a)(2)(ii)(E) of this section;

(iii) A statement of the quantity of the coal to be supplied and/or delivered which is sufficient to enable the source to achieve the emission reduction required by paragraph (a)(2)(i)(E) or (a)(2)(ii)(E) of this section;

(iv) A provision (or separate contract or obligation) to assure transportation and delivery of such coal to the source; and

(v) A provision specifying the term during which such coal shall be supplied and/or delivered.

(2) A contract (or other obligation enforceable against such source) to provide for obtaining a continuous emission reduction system shall include, as a minimum, the following:

(i) An identification of the type of system to be installed; and

(ii) A statement of the control efficiencies to be achieved by such systems and the conditions under which such control efficiency will be met, including the quality and grade of coal required.

(3) A contract (or other obligation enforceable against such source) to provide for obtaining a long-term supply of coal or to provide for obtaining continuous emission reduction systems shall include, as a minimum, the following:

(i) The signatures of the parties to the contract (or obligation) or other evidence of firm commitment;

(ii) For such contracts (or obligations) entered after June 22, 1974, a provision that the Administrator's written approval is a condition precedent to the contract (or obligation);

(iii) Deadlines for performance which insure that the schedule for

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compliance as required by paragraph (a)(2) and paragraph (b) of this section will be met;

(iv) A requirement that the supplier, vendor, or other party contracting with the source shall report to the source, at regular intervals, on progress toward or status of performance of such party's obligations, any existing or anticipated problems which would prevent or delay such performance, and any steps being taken to remedy such problems; and

(v) A requirement that whenever the supplier, vendor, or other party contracting with the source encounters or anticipates problems which could prevent or delay performance of such party's obligations, such party shall immediately report all relevant circumstances and any remedial steps to the source.

(d) The Administrator shall approve, disapprove or modify any plan for compliance submitted as required by paragraph (a)(2) and paragraph (b) of this section and shall approve or disapprove any contract submitted as required by paragraph (c) of this section within 60 days after such plan or contract is submitted.

(e) The Administrator shall set forth any necessary primary standard condition, regional limitation and any interim requirements (including enforceable compliance schedules to meet such requirements) which the Administrator determines are reasonable and practicable as conditions of any plan for compliance. A source may submit, as a part of its plan for compliance, a proposal for legally enforceable limitations, requirements, or other measures which will assure (throughout the period that the compliance date extension will be in effect) that the burning of coal by such source will not result in emissions which cause or contribute to concentrations of any air pollutant in excess of any national primary ambient air quality standard for such pollutant. Such proposal is subject to the Administrator's approval, disapproval or modification.

(f) The Administrator may require the monitoring of ambient air concentrations in the vicinity of the source as a condition of any compliance date extension.

(g) Six months after the Administrator issues a compliance date extension, and every six months thereafter, the source shall submit a report to the Administrator which details the source's progress toward achieving compliance with all applicable air pollution requirements.

(h) If a compliance date extension is issued to a source, such source shall not, during the period of the extension, be prohibited, by reason of the application of any air pollution requirement, from burning coal which is available to such source, except as provided under section 119(d)(3) of the Act.

(i) A source may, upon the expiration of a compliance date extension, apply for and receive from the Administrator a one-year postponement of the application of any requirement of an applicable implementation plan under the conditions set forth and in the manner provided by section 110(f) of the Act.

(j) Upon timely application by the source, the Administrator may postpone for 30 days the time allowed for the submittal of information required under paragraphs (a) or (b) of this section if he finds that, despite the source's good faith efforts to meet the specified deadlines, good cause has been shown for such postponement. Subsequent 30 day postponements may be granted if a showing is made that good cause continues to exist.

(k) The Administrator may permit a later submittal of the information required under paragraph (a) or (b) of this section where the Governor of the State in which the source is located certifies to the Administrator, within the time permitted for such submittal, that he is considering recommending a State implementation plan revision which is consistent with section 110(a)(3)(B) of the Act, that additional time is necessary to formulate and act upon such recommendation, and that a projected timetable for the completion of the revision process will be provided to the Administrator. Such a timetable may be dependent upon receipt of the Administrator's recommendation under section 110(a)(3)(B) of the Act.

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(l) The Administrator may, where reasonable and appropriate, require the submittal of contracts at the same time information is submitted as required by paragraph (a) or (b) of this section.

(m) Any source which is eligible for a compliance date extension under § 55.01(b)(1)(i) but whose application for such extension is denied because the Administrator has determined that such source can meet all air pollution requirements without a compliance date extension, shall submit to the Administrator, within 30 days after such denial of a compliance date extension, the information required under paragraphs (a)(1)(i) and (ii) of this section.

(n) If the Administrator finds that a source has failed to apply for a compliance date extension in order to avoid an order issued under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974, he may take appropriate action under section 113 of the Act to assure a prompt submittal of the information required under paragraphs (a)(2) through (5) of this section.

(o) If any item of information required to be submitted by a source under this section has previously been submitted to the Administrator to enable him to advise the Administrator of the Federal Energy Administration of the consequences of issuing an order to such source under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974, then such source is not required to resubmit such information to the Administrator unless the information previously submitted is no longer accurate, in which case an update of the initial submittal must be provided by the source.

(p) Any compliance date extension issued by the Administrator shall not become effective until after the actual conversion from petroleum products or natural gas to coal.

(q) The Administrator may, on his own motion, postpone the date for submittal of the information required under paragraph (a) or (b) of this section if the State in which a source required to make such submittal is located has submitted a plan revision under 40 CFR, Part 51 to the Administrator for approval, such plan revision is presently being reviewed by the Administrator, and such plan revision would revise an air pollution requirement applicable to such source.

[40 FR 18440, Apr. 28, 1975, as amended at 40 FR 58645, Dec. 18, 1975]

§ 55.05 Temporary suspensions.

(a) Any person (including a public officer or public agency) may apply to the Administrator for a temporary suspension under section 119(b) of the Act. The conditions of eligibility for a temporary suspension are set forth in § 55.01(c).

(b) The Administrator may act on his own motion in issuing a temporary suspension.

(c) The Administrator shall issue a temporary suspension to any person for whom an application has been filed and which is eligible under § 55.01(c)(2) if he determines (after considering the risk to public health and welfare, whether the issuance of a suspension will assist in meeting the essential needs of the United States for fuels and other appropriate factors) that issuance of a suspension to such person would be consistent with the purposes of the Energy Supply and Environmental Coordination Act of 1974.

(d) Any temporary suspension issued by the Administrator shall be conditioned upon compliance with such interim requirements as the Administrator determines are reasonable and practicable. Such interim requirements shall include, but need not be limited to:

(1) Submission of such reports as the Administrator determines may be necessary.

(2) Such measures as the Administrator determines are necessary to avoid an imminent and substantial endangerment to health of persons, and

(3) In the case of a person who is eligible for a suspension under § 55.01(c)(1), requirements that the suspension shall be inapplicable for any period during which fuels which would enable compliance with the suspended stationary source fuel or emission limitations are in fact reasonably

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available (as determined by the Administrator) to such person.

(e) A source described in § 55.01(c)(2) which applies for a suspension must submit emissions data, information on the fuel and emission reduction measures to be employed during the time the suspension is applicable, and air quality data in order to enable the Administrator to prescribe any necessary primary standard condition on the suspension.

(f) In the case of a source which applies to the Administrator for a suspension under § 55.01(c)(1), the source shall submit with the application the following information as a minimum:

(1) Present fuel inventory, by quantity and quality (including sulfur, ash and heat content) and storage capacity;

(2) Comparison of present supplies and storage capacity with the inventories during comparable periods of the previous two years;

(3) A statement of the source's understanding of the reasons that types or amounts of fuel which would enable compliance are not available or documentation of the reasons given by traditional fuel suppliers for being unable to meet the source's needs;

(4) Names of suppliers contacted, dates of contact, and quantity and quality (including sulfur, ash and heat content) of fuel sought; and

(5) Description of fuel demands.

(g) In the case of a fuel supplier which applies to the Administrator for a suspension under § 55.01(c)(1), the fuel supplier shall submit the following information as a minimum:

(1) Present fuel inventory by quantity and quality (including sulfur, ash and heat content) and storage capacity;

(2) Comparison of present supplies and storage capacity with the inventories during comparable periods of the previous two years;

(3) Description of the fuel demands of the customers of the supplier located in the air quality control region(s) for which the supplier is requesting a suspension;

(4) Documentation of the reasons for the supplier's inability to provide adequate supplies of fuel which would permit compliance with applicable stationary source fuel or emissions limitations;

(5) Documentation which evidences efforts made by the supplier to obtain fuels which would permit compliance with applicable stationary source fuel or emission limitations.

(h) Any source which is issued an order (which will not apply after June 30, 1975) by the Administrator of the Federal Energy Administration under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974 shall submit within 90 days after such source is issued such order (or within 90 days after the effective date of these regulations, if such order is issued prior to the effective date of the regulations) to the Administrator the following:

(1) If the source is not applying for a temporary suspension:

(i) A listing of all applicable State and local air pollution requirements together with a certification of the date that the source will be able to burn coal and comply with each applicable air pollution requirement without a temporary suspension, and

(ii) A plan for compliance which includes the necessary steps the source must take to comply with each applicable air pollution requirement.

(2) If the source is applying for a temporary suspension:

(i) A certification of the date by which the source will be able to burn coal without emitting any pollutant in amounts which cause or contribute to concentrations in excess of any national primary ambient air quality standard for such pollutant, and

(ii) A plan for compliance which includes the necessary steps the source must take to comply with applicable stationary source fuel or emission limitations.

(i) If any source which is not subject to an order issued under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974 applies for a temporary suspension because it began conversion to the use of coal as its primary energy source during the period beginning on September 15, 1973, and ending on March 15, 1974, then the source shall submit the information required in paragraph (h)(2) of this section and evidence to

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support a determination by the Administrator in accordance with paragraph (b) of § 55.04 that such source began conversion during such time.

(j) The Administrator may postpone for 30 days the time period for the submittal of the information required under paragraph (h) of this section if he finds that, despite the source's good faith efforts to meet the specified deadlines, good cause exists for such postponement. Subsequent 30 day postponements may be granted.

(k) The Administrator may suspend, postpone or modify the requirements for submittal of information under paragraphs (f) and (g) of this section if he finds that a widespread shortage of types or amounts of fuels exists and that such shortage is of such severity that expedited procedures under this section are necessary and desirable.

(l) If any item of information required to be submitted by a source under this section has previously been submitted to the Administrator to enable him to advise the Administrator of the Federal Energy Administration of the consequences of issuing an order to such source under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974, then such source is not required to resubmit such information to the Administrator unless the information previously submitted is no longer accurate, in which case an update of the initial submittal must be provided by the source.

(m) Any temporary suspension issued by the Administrator to a source which is eligible for such suspension under § 55.01(c)(2) shall not become effective until after the actual conversion from petroleum products or natural gas to coal.

§ 55.06 Sources ordered to burn coal which are not eligible to apply for either a compliance date extension or a temporary suspension.

(a) Any source which has been issued an order under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974 and which is not eligible to apply for a compliance date extension under § 55.01(b) or cannot qualify for a temporary suspension under § 55.01(c) shall submit, within 90 days after such source is issued such order (or within 90 days after the effective date of these regulations, if such order is issued prior to the effective date of these regulations) to the Administrator the following:

(1) A certification of the date that the source will be able to burn coal and comply with all applicable air pollution requirements, and

(2) A plan for compliance which includes the necessary steps the source must take to comply with all applicable air pollution requirements.

(b) The Administrator may postpone for 30 days the time period for the submittal of the information required under paragraph (a) of this section if he finds that, despite the source's good faith efforts to meet the specified deadlines, good cause exists for such postponement. Subsequent 30 day postponements may be granted.

(c) If any item of information required to be submitted by a source under this section has previously been submitted to the Administrator to enable him to advise the Federal Energy Administrator of the consequences of issuing an order to such source under section 2 of the Energy Supply and Environmental Coordination Act of 1974, then such source is not required to resubmit such information to the Administrator unless the information previously submitted is no longer accurate, in which case an update of the initial submittal must be provided by the source.

§ 55.07 Petitions by air pollution control agencies.

(a) Any air pollution control agency may petition the Administrator to modify any primary standard condition in order to assure (throughout the period of a compliance date extension or a temporary suspension) that the source will not emit any air pollutant to a degree which causes or contributes to concentrations in excess of any national primary ambient air quality standard for such pollutant.

(b) Any air pollution control agency may petition the Administrator to certify to the Federal Energy Administrator that an order issued under section 2(a) of the Energy Supply and Environmental Coordination Act of 1974

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shall not be in effect for any period during which the burning of coal by a source will result in an increase in emissions of any air pollutant for which national ambient air quality standards have not been promulgated (or an air pollutant which is transformed in the atmosphere into an air pollutant for which such a standard has not been promulgated), and that such increase may cause (or materially contribute to) a significant risk to public health.

(c) The Administrator may on his own motion initiate the proceedings referred to in paragraphs (a) and (b) of this section.

§ 55.08 One year postponement for power plant shutdown.

(a) At any time prior to the date on which an electric generating power plant is required to comply with an applicable implementation plan requirement, such power plant may apply (with the concurrence of the Governor of the State in which such plant is located) to the Administrator to postpone the applicability of such requirement for not more than one year. Such postponement shall commence on the final date for compliance with the implementation plan in effect at the time of application for postponement (except that no such postponement shall apply for more than one year after the applicable date for attainment of the primary standard for the pollutant involved).

(b) Any electric generating power plant is eligible for a postponement under paragraph (a) of this section if:

(1) Because of the age and condition of the plant, the plant is to be taken out of service permanently not later than January 1, 1980, according to the power supply plan (in existence on January 1, 1974) of the owner or operator of such plant,

(2) A certification to that effect has been filed by the owner or operator of the plant with the Administrator and the Federal Power Commission, and

(3) The Federal Power Commission has determined that the certification has been made in good faith and that the plan to cease operations no later than January 1, 1980, will be carried out as planned in light of existing and prospective power supply requirements.

(c) If the Administrator determines, after considering the risk to public health and welfare which may be associated with a postponement under paragraph (a) of this section, that compliance with any requirement of an applicable implementation plan is not reasonable in light of the projected useful life of the plant, the availability of rate base increases to pay for the costs of such compliance, and other appropriate factors, then the Administrator shall grant a postponement of any such requirement.

(d) The Administrator shall, as a condition of any postponement under paragraph (a) of this section, prescribe such interim requirements as are practicable and reasonable in light of the criteria in paragraph (c) of this section.

§ 55.09 General requirements.

The Administrator may require the submittal of any additional information, including emissions data for any air pollutant for which national ambient air quality standards have not been promulgated (or an air pollutant which is transformed in the atmosphere into an air pollutant for which such a standard has not been promulgated), which is reasonably necessary to implement this part and section 119 of the Act.

Subpart B—Alabama

§§ 55.50—55.69 [Reserved]

Subpart C—Alaska

§§ 55.70—55.89 [Reserved]

Subpart D—Arizona

§§ 55.90—55.109 [Reserved]

Subpart E—Arkansas

§§ 55.110—55.129 [Reserved]

Subpart F—California

§§ 55.130—55.149 [Reserved]

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Subpart G—Colorado

§§ 55.150—55.169 [Reserved]

Subpart H—Connecticut

§§ 55.170—55.189 [Reserved]

Subpart I—Delaware

§ 55.190 Delayed compliance order.

The Administrator hereby issues a delayed compliance order to the E. I. du Pont de Nemours & Co. ("the Du Pont Co."), Seaford Plant, boiler Nos. 2 and 3, Seaford, Del. ("the source"), upon the following conditions:

(a) *Primary standard conditions.* The source shall not burn coal which results in the emissions of particulate matter in excess of 670 pounds of particulate matter per hour in accordance with the following schedule of compliance:

(1) During the period of the order's effectiveness, the Du Pont Co. shall operate and maintain the existing particulate collector to insure a minimum removal efficiency of 80 percent at total capacity, and shall not burn coal with an ash content exceeding 12 percent and a heating value of less than 12,500 BTU's per pound.

(2) Within 30 days of receipt of this order, the Du Pont Co. shall submit a proposal for a complete air quality monitoring network to be set up by the source as required by paragraph (VI)(A)(1).

(3) Within 90 days of receipt of this order, the Du Pont Co. shall complete installation and begin operation of the air quality monitoring network.

(4) Within 90 days of receipt of this order, the Du Pont Co. shall submit for EPA approval the methods, procedures and devices the company intends to use to obtain the information required by paragraph (VI)(B).

(b) *Plan for compliance with regulations IV, and XIV.* The source shall comply with regulations IV and XIV of the Department of Natural Resources and Environmental Control in accordance with the following increments of compliance:

(1) Completed—Enter into contracts for particulate emissions controls and other equipment necessary for final compliance.

(2) Completed—Submit for approval to the Director of the EPA Region III Air and Hazardous Materials Division (hereinafter referred to as the Director), contracts for continuous particulate emission reduction systems and other equipment necessary for final compliance.

(3) Completed—Initiate on site construction or installation of continuous particulate control systems.

(4) June 25, 1979—Complete onsite construction or installation of continuous particulate control systems for boiler No. 3.

(5) August 20, 1979—Complete onsite construction or installation of continuous particulate control systems for boiler No. 2.

(6) September 20, 1979—Perform emission tests in accordance with 40 CFR, Part 60 and submit reports demonstrating final compliance with the State of Delaware's Department of Natural Resources and Environmental Control Regulations IV and XIV.

(c) *Interim requirements.* The source shall comply with the following interim requirements prior to achieving compliance with regulations IV and XIV of the Department of Natural Resources and Environmental Control.

(1) Within 60 days of installation of the continuous opacity monitor required, the Du Pont Co. shall conduct a performance specification test (PST) in accordance with performance specification 1, Appendix B of Part 60, Title 40 of the Code of Federal Regulations. The Du Pont Co. shall notify the regional energy coordinator of the date on which the PST will be conducted at least 30 days prior to such date.

(2) Within 45 days of the PST, the Du Pont Co. shall submit a complete report containing all information pertinent to the PST to the regional energy coordinator.

(3) The Du Pont Co. shall keep monthly records of air quality and air pollution emissions data and shall be submitted within 15 days of the end of each calendar month. These records shall detail daily emissions for all fuel-burning units and shall include:

(i) Fuel consumption for each day of the preceding month.

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(ii) Analysis of each incoming coal car and a weekly composite from each supplier for moisture, volatile ash, sulfur, and high heating value.

(iii) For the stack serving boiler Nos. 2 and 3, a record of the hourly measurement of opacity acquired by means of a continuous opacity monitoring device.

(4) The Du Pont Co. shall notify the director of any instances of exceeding the national primary ambient air quality standards within 72 hours of the collection of such data.

(5) The Du Pont Co. shall notify the director within 10 days after each incremental requirement has been satisfied, or within 10 days after the final date set for achieving each such requirement, if such requirememt has not been achieved.

(d) Violation of any requirement of this order shall result in one or more of the following actions:

(1) Enforcement of such requirement pursuant to subsection 113 (a), (b), or (c) of the Clean Air Act, including possible judicial action for injunction and/or penalties and in appropriate cases, criminal prosecution.

(2) Revocation of this order, after notice and opportunity for a public hearing, and subsequent enforcement of the Delaware State implementation plan.

(3) If such violation occurs on or after July 1, 1979, notice of noncompliance and subsequent action pursuant to section 120 of the act.

(e) Nothing herein shall affect the responsibility of the Du Pont Co. to comply with State, local, or other Federal laws or regulations.

The entire order is hereby referenced. Any terms or conditions appearing in the order and not contained herein does not excuse compliance by the Du Pont Co.

(42 U.S.C. 7413(d))

[43 FR 38704, Aug. 30, 1978]

§§ 55.191—55.209 [Reserved]

Subpart J—District of Columbia

§§ 55.210—55.229 [Reserved]

Subpart K—Florida

§ 55.230 Federal delayed compliance orders issued under section 113(d)(5) of the Act.

The Administrator hereby issues a delayed compliance order (DCO) to the Florida Power Corp. (FPC), Crystal River Plant Unit No. 2 boiler located near Red Level, Fla., upon the following conditions:

(a) *Submittal of reports.* FPC shall submit all source performance test results, reports and other items required by this order to the Director, Enforcement Division, U.S. Environmental Protection Agency, 345 Courtland Street, Atlanta, Ga. 30308 (hereinafter referred to as the "Director"), with copies to the Secretary, Florida Department of Environmental Regulation, 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Fla. 32301 (hereinafter referred to as the "Secretary").

(b) *Milestone certification.* FPC shall submit, no later than ten (10) days after the deadline for completing each milestone required by section (k), certification to the Director and Secretary whether such milestone has been met.

(c) *Notice of tests.* FPC shall provide the Director and Secretary with twenty (20) days notice prior to the conducting of any performance tests as required by the DCO in order to afford an opportunity to evaluate the test procedure and to have an observer present at such testing.

(d) *Malfunctions.* The FPC shall perform operation and maintenance practices on all sources as necessary to prevent breakdowns or malfunctions and to reduce emissions in excess of regulations to the maximum extent practicable. When emissions due to sudden and unforeseen malfunction of the affected facility are or may be in excess of the maximum allowable as set forth in this DCO, for greater than four (4) hours, the owner or operator

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shall notify this office and the appropriate State or local air pollution control agency by telephone or telegram as promptly as possible, and in no event later than twelve (12) hours following the start of the malfunction, and shall cause written notice to be sent to the Director and the Secretary, no later than the end of the next working day following the start of such malfunction. Such notices shall specify the name of the affected facility, its location, the address and telephone number of the person responsible for the affected facility, the nature and cause of the malfunction, the date and time when such malfunction was first observed, the expected duration, and an estimate of the physical and chemical composition, rate, and concentration of the emission. FPC shall remedy the malfunction or breakdown as soon as possible thereafter and shall take reasonable steps to reduce emissions in excess of the interim emission limits during the malfunction or breakdown. The Regional Administrator shall have the authority during a breakdown or malfunction to require FPC to take specific steps to reduce emissions, including process equipment modifications and/or reductions, or termination if necessary. Within ten (10) days after the termination of a breakdown or malfunction requiring the above notification, the owner or operator shall submit:

(1) The time the excess emission began and ended;

(2) The time of the beginning and end of the breakdown or malfunction which is asserted to be the cause of the excess emission;

(3) An estimate of the physical and chemical composition, rate, and concentration of emissions which occurred, and where continuous monitoring is required or is in effect (including visible emission detector), the strip charts with plots of emissions monitored versus time, including a summary of the monitoring instruments' written record expressed in units of the applicable standard;

(4) An explanation and, where appropriate, an engineering analysis of the cause of the malfunction or breakdown;

(5) A description of those operating and/or maintenance procedures and practices in use prior to and during the occurrence, which were designed to prevent or minimize the extent and duration of the malfunction or breakdown;

(6) Any other steps taken to minimize the extent or duration of the malfunction or breakdown;

(7) An analysis of what steps will be taken to prevent or minimize similar occurrences in the future; and

(8) Such additional information as the Regional Administrator may require.

This provision does not exempt the FPC from enforcement action as specified in paragraph (j) of this section, if the interim emission limits are exceeded at any time.

(e) *Progress reports.* FPC shall submit, no later than fifteen (15) days after the end of each quarter, commencing with the April 1, 1978 to June 30, 1978 quarter, a progress report for the emission point specified in this DCO. These reports shall contain specific information on the progress toward each milestone in paragraph (k) of this section. If any delay is anticipated in meeting said milestone, FPC shall immediately notify the Director in writing of the anticipated delay and reasons therefor. Notification to EPA of any anticipated delay shall not excuse the delay.

(f) *Interim limits.* FPC shall comply with the following interim limits prior to achieving compliance with § 17-2.04(6)(e) of the Air Pollution of the State of Florida.

(1) Particulate emissions from Crystal River Unit 2 shall not exceed 0.10 pound per million BTU heat input maximum 2-hour average.

(2) [Reserved]

(3) FPC as part of the control strategy shall operate, calibrate, and maintain an instrument to continuously monitor and record visible emissions from Crystal River Unit 2. Visible emissions from Crystal River Unit 2 shall be limited to 20% opacity averaged over a six-minute period recorded by the continuous opacity monitor. In the event of a malfunction of the continuous opacity monitor, opacity shall

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be determined in accordance with EPA Reference Method 9 averaged over a six-minute period. The continuous opacity monitor strip charts shall be maintained by the Company and be subject to EPA review when requested.

(4) If, at any time during the effective period of this DCO, the applicable interim particulate or visible emission limits are exceeded, FPC shall immediately take all actions necessary to minimize or abate such excess emissions and to prevent the recurrence of such excess emissions; FPC shall notify the Director and Secretary of the occurrence as soon as possible, but no later than 48 hours after the start of the occurrence; and FPC shall, within 10 days after the termination of each occurrence, submit to the Director and Secretary a written report regarding the occurrence, which shall address the cause(s) of the occurrence and all efforts FPC has taken to date concerning it.

(5) In the event the continuous monitoring equipment required under Administrative Order Docket No. AO 76-131(a) malfunctions or otherwise fails to operate in accordance with the requirements established in the October 6, 1975, FEDERAL REGISTER beginning on page 46254, as revised in the January 31, 1977, FEDERAL REGISTER beginning on page 5936, and any subsequent amendments thereto, FPC shall immediately take all actions necessary to correct the malfunction, or to repair or replace the Monitor, if necessary; FPC shall notify the Director and Secretary as soon as possible, but no later than forty-eight (48) hours after the start of such occurrence, and FPC shall, within 10 days after the termination of such occurrence, submit a written report to the Director and the Secretary regarding such occurrence, which report shall specify the cause of the occurrence and the actions taken by FPC to correct the occurrence and to prevent its recurrence in the future.

(6) Compliance with interim particulate emission limits shall be demonstrated periodically as required by the Director or the Secretary.

(g) *Compliance responsibility.* Nothing herein shall affect the responsibility of the source to comply with all applicable Federal, State, or local regulations.

(h) *Noncompliance responsibility.* FPC is hereby notified that failure to achieve final compliance by September 30, 1980, and maintain compliance thereafter, shall result in one or more of the actions identified in paragraph (j)(1) of this section. In addition, noncompliance beyond September 30, 1980, will subject FPC to an administratively assessed noncompliance penalty pursuant to the requirements of section 120 of the Act and any rules and regulations promulgated pursuant thereto, unless FPC is exempted by section 120(a)(2) (B) or (C) of the Act. In the event of noncompliance after September 30, 1980, FPC will be formally notified of its noncompliance pursuant to section 120(b)(3) of the Act.

(i) This Delayed Compliance Order shall be terminated in accordance with section 113(d)(8) of the Act if the Administrator determines on the record, after notice and hearing, that an inability to comply with Florida Chapter 17-2.04(6) no longer exists.

(j) Violation of any requirement of this Delayed Compliance Order shall result in one or more of the following actions:

(1) Enforcement of such requirement through the commencement of a civil action for injunctive relief and the assessment of civil penalties pursuant to section 113(b) of the Act, or a criminal prosecution pursuant to section 113(c) of the Act, or both;

(2) Revocation of this Delayed Compliance Order, after notice and opportunity for a public hearing, and subsequent enforcement of Chapter 17-2.04(6) in accordance with sections 113 (b) and/or (c) of the Act.

(k) Florida Power Corp. shall complete the following acts with respect to control of particulate emissions for its Crystal River Unit 2, located near Red Level, Fla., on or before the dates specified:

(1) Completed—Submit to the Director of the Enforcement Division a final control plan that describes the steps which will be taken to achieve compliance with the applicable regulations.

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(2) August 30, 1978—Negotiate and sign all necessary contracts for particulate emission control systems or issue orders for the purchase of component parts to accomplish emission control.

(3) November 30, 1978—Initiate onsite construction or installation of particulate emission control equipment.

(4) October 30, 1980—Complete onsite construction or installation of particulate emission control equipment.

(5) December 30, 1980—Complete shakedown operations and performance tests for particulate emissions in accordance with EPA reference methods as contained in 40 CFR Part 60, Appendix A on the emission control equipment; also achieve compliance with the Florida Air Pollution Rules, Chapter 17-2 and certify such compliance to the Director of the Enforcement Division, Region IV.

As amended, Delayed Compliance Order Docket No. DCO-78-6 issued on November 21, 1978, shall remain in full force and effect until termination by EPA.

(42 U.S.C. 7413(d))

[43 FR 54248, Nov. 21, 1978, as amended at 45 FR 73929, Nov. 1980]

§§ 55.231—55.249 [Reserved]

Subpart L—Georgia

§ 55.250 Compliance date extensions.

(a) The Administrator issues compliance date extensions to the Savannah Electric and Power Company's Port Wentworth Generating Station for Units 1, 2, and 3, located in Chatham County, Georgia, upon the following conditions:

(1) *Regional Limitation.* The Savannah Electric and Power Company shall comply with section 391-3-1-.02(2)(d) of the Georgia Rules and Regulations for Air Quality Control on or before December 31, 1978, in accordance with the schedules below. This regulation deals with particulate emission limits for fuel-burning equipment. The Savannah Electric and Power Company shall complete the following acts with respect to Units 1, 2, and 3 of its Port Wentworth Generating Station on or before any time limit specified below.

(i) Completed—Submit to the Director of the EPA Region IV Enforcement Division (hereafter in this paragraph referred to as the Director), a final control plan describing the steps which will be taken to achieve compliance with applicable particulate emission limiting regulations for Units 1, 2, and 3.

(ii) December 20, 1976—Negotiate, submit to the Director for approval, and sign all necessary contracts for particulate emission control equipment or issue orders for the purchase of component parts to accomplish particulate emission control following the conversion to coal at Units 1, 2, and 3.

(iii) Completed. Initiate site preparation toward installation of particulate emission control equipment for Units 1, 2, and 3.

(iv) April 1, 1978. Initiate on-site construction or installation of particulate emission control equipment for Units 1, 2, and 3.

(v) December 15, 1977—Submit to the Director coal contracts for coal of the appropriate specifications to enable compliance with all applicable air pollution requirements in conjunction with the particulate emission control equipment specified in paragraph (a)(1)(ii) of this section.

(vi) August 1, 1978 (Unit 1), September 1, 1978 (Unit 2), October 1, 1978 (Unit 3). Complete on-site construction or installation of particulate emission control equipment and initiate use of such equipment.

(vii) October 15, 1978 (Unit 1), November 15, 1978 (Unit 2), December 31, 1978 (Unit 3). Complete shakedown operations and performance tests on the control equipment required by this paragraph; also, demonstrate compliance with section 391-3-1.02(2)(d) of the Georgia Rules and Regulations for Air Quality Control and certify such compliance to the Director of the EPA Region IV Enforcement Division.

(viii) The Savannah Electric and Power Company must give the Director twenty (20) days notice before conducting any performance tests in order to afford the Director an opportunity to approve the test procedure and to have an observer present. All tests

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must conform to the procedures Method 5 set forth in Appendix A of 40 CFR, Part 60.

(2) The Savannah Electric and Power Company is required to notify the Director no later than ten (10) days after the completion of each time period as specified in this paragraph, as to whether the corresponding incremental step toward compliance has been completed. The Company must also submit status reports to the Director at six-month intervals.

(3) The units shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857c-10(d)(3)).

[41 FR 55194, Dec. 17, 1976, as amended at 42 FR 56608, Oct. 27, 1977]

§§ 55.251—55.269 [Reserved]

Subpart M—Hawaii

§§ 55.270—55.289 [Reserved]

Subpart N—Idaho

§§ 55.290—55.309 [Reserved]

Subpart O—Illinois

§ 55.310 Federal administrative orders issued under Section 113(d)(5) of the Act.

ORDER

Therefore, it is hereby ORDERED that:

I. Boiler No. 5 at Argonne shall achieve and demonstrate compliance with Illinois Pollution Control Board Rules 202(b), 203(g)(1)(A) and 204(c)(1)(A) in accordance with the following schedule:

A. Award contracts for the design and installation of new emission control system by October 30, 1980.

B. Initiate on-site construction by May 15, 1981.

C. Complete on-site construction by January 15, 1982.

D. Perform final compliance testing by February 15, 1982.

E. Submit results of final compliance testing and demonstrate compliance with the Illinois SIP by March 15, 1982.

II. DOE and its operating contractor shall achieve and demonstrate final compliance with the applicable rules by performing emission tests in accordance with 40 CFR Part 60. DOE shall notify U.S. EPA in writing at least thirty (30) days in advance of performing the required tests.

III. Not later than ten (10) working days after any date for achievement of any step specified in this ORDER, DOE shall notify U.S. EPA in writing of its compliance or noncompliance with the requirement. In addition, progress reports shall be submitted to U.S. EPA on February 1, 1981 and September 15, 1981. Furthermore, if any event occurs which causes or may cause a delay in meeting any requirement contained in this ORDER, DOE shall immediately notify U.S. EPA in writing of the delay or anticipated delay as appropriate, describing in detail the precise cause or causes of the delay, the measures taken and to be taken by DOE and its operating contractor to prevent or minimize the delay and the timetable by which those measures will be implemented. DOE and its operating contractor will adopt all reasonable measures to avoid or minimize any such delay.

IV. Pursuant to Sections 113(d)(5)(B) and 113(b)(7) of the Act, Boiler No. 5 at Argonne shall comply with the following interim requirements. Such requirements are necessary to insure compliance with the federally approved Illinois State Implementation Plan, insofar as Boiler No. 5 is able to during the period in which this ORDER is in effect. If these requirements are proposed to be modified, such proposal shall be published in the FEDERAL REGISTER and promulgated in accordance with procedures for informal rulemaking:

A. Boiler No. 5 at Argonne shall not burn coal with an ash content greater than 6.5 pounds ash per million BTU, and a sulfur content greater than 1.3 pounds sulfur per million BTU.

B. Boiler No. 5 at Argonne shall not emit in excess of 0.63 pounds of particulate matter per million BTU and 2.39 pounds of sulfur dioxide per million BTU.

C. DOE and its operating contractor shall operate and maintain the existing multiclone of Boiler No. 5 to insure a minimum removal efficiency of eighty-five percent (85%) at total capacity.

V. DOE and its operating contractor shall install and operate an ambient air quality monitoring network in the vicinity of Boiler No. 5 at Argonne from which they will collect ambient air quality data as follows:

A. The network shall contain monitors capable of measuring 24-hour and annual average particulate matter concentrations.

B. The network shall be approved by U.S. EPA prior to installation and operation.

C. The network shall be operational by the time that DOE and its operating con-

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tractor commence use of coal in Boiler No. 5 at Argonne.

D. DOE shall keep monthly records of the air quality monitoring data from the network. Copies of these records shall be submitted within twenty (20) days of the end of each calendar month.

VI. The period of effectiveness of this ORDER shall not include any interval after U.S. EPA finds and notifies DOE that (1) a national primary ambient air quality standard for any pollutant is being exceeded in the Metropolitan Chicago Interstate Air Quality Control Region and (2) DOE has failed to submit adequate evidence showing that the requirements of Section 113(d)(5)(D)(i) through (iii) of the Act have been satisfied. During such intervals, if any, full compliance with the Illinois State Implementation Plan (excluding this ORDER) shall be required of DOE and its operating contractor, and violations by them of the Plan shall be subject to enforcement action under Section 113 of the Act.

VII. DOE and its operating contractor shall install a continuous emission monitoring and recording system for the measurement of opacity in the control device stack of Boiler No. 5 as follows:

1. Such a system shall be installed in appropriate locations, calibrated, maintained and operated in accordance with the procedures set forth at 40 CFR Part 60, Appendix B.

2. Prior to the actual installation of the continuous opacity monitoring system, DOE shall submit drawings showing the proposed locations of such equipment for U.S. EPA's review and approval.

3. The continuous monitoring devices shall be installed and calibrated, and the continuous monitoring and recording system shall be fully operational by the time that the use of coal is commenced. Monitor data from this system shall be retained by DOE's operating contractor for two years.

VIII. Nothing in this ORDER shall affect DOE's and its operating contractor's responsibility to comply with any other Federal, State or local regulations.

IX. Nothing in this ORDER shall be construed as a waiver by the Administrator of any rights or remedies under the Clean Air Act, including, but not limited to, Section 303 of the Act, 42 U.S.C. Section 7603.

X. All submissions and notifications to the U.S. EPA pursuant to this ORDER shall be made to the Chief, Air Compliance Section, U.S. EPA, Region V, 230 South Dearborn Street, Chicago, Illinois 60604. A copy of all such submissions and notifications shall be to Director, Illinois Environmental Protection Agency, 2200 Churchill Road, Springfield, Illinois 62706.

XI. DOE and its operating contractor are hereby notified that their failure to achieve and demonstrate final compliance at Boiler No. 5 with the applicable regulations of the Illinois State Implementation Plan by March 15, 1982 may result in a requirement to pay a noncompliance penalty under Section 120 of the Act, 42 U.S.C. 7420. Such requirement may be imposed at an earlier date, as provided by Section 113(d) and 120 of the Act, either in the event that this ORDER is terminated in accordance with Section 113(d)(8) of the Act, or in the event that any requirement of this ORDER is violated, as provided in Section 113(d)(9) of the Act. In any event, DOE will be formerly notified, pursuant to Section 120(b)(3) of the Act and any regulations promulgated thereunder, of its noncompliance.

XII. This ORDER shall be effective January 27, 1981.

Dated: January 19, 1981.

DOUGLAS M. COSTLE,
Administrator.

The United States Department of Energy and the University of Chicago reviewed this ORDER and believe it to be a reasonable means by which Boiler No. 5 can achieve final compliance with the Illinois State Implementation Plan. The United States Department of Energy and the University of Chicago stipulate as to the correctness of all facts stated above and consent to the requirements and terms of this ORDER.

Dated: December 11, 1980.

FRED C. MATTMUELLER,
Manager/Regional Representative, United States Department of Energy, Chicago Operations and Regional Office.

Dated: December 11, 1980.

WALTER E. MASSEY,
Director, Argonne National Laboratory, University of Chicago.

[46 FR 8492, Jan. 27, 1981]

Subpart P—Indiana

§§ 55.330—55.349 [Reserved]

Subpart Q—Iowa

§ 55.350 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to Iowa Electric Light and Power Company, Sutherland Station, Units 1, 2, and 3 (hereinafter referred to as "the sources"), located on East Main Street in Marshalltown, Iowa, upon the following conditions:

(1) *Regional Limitation.* Units 1, 2, and 3 shall comply with Iowa Department of Environmental Quality

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(IDEQ) Regulation 4.3(2)b by December 31, 1976.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section shall be in accordance with IDEQ Regulations, Chapter 7—*Measurement of Emissions.*

(3) The sources shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39316, Sept. 16, 1976]

§ 55.351 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to Iowa Public Service Company, George Neal Station, Unit #1, located in Salix, Iowa [hereinafter referred to as "the source"], upon the following conditions:

(1) Regional limitation. Unit 1 shall comply with IDEQ Regulations 4.3(2)b and 4.3(2)d by October 1, 1978.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section shall be in accordance with IDEQ Regulations, Chapter 7—Measurement of Emissions.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39317, Sept. 15, 1976]

§§ 55.352—56.369 [Reserved]

Subpart R—Kansas

§ 55.370 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to The Kansas Power and Light Company, Lawrence Energy Center, Units 3 and 5, Lake View Road, Lawrence, Kansas (the source) upon the following conditions:

(1) *Regional limitation.* The source shall comply with Kansas Air Pollution Emission Control Regulation 28-19-31A by December 31, 1977.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section, shall be in accordance with EPA Test Method 5.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

(b) The Administrator issues a Compliance Date Extension to The Kansas Power and Light Company, Lawrence Energy Center, Unit 4, Lake View Road, Lawrence, Kansas (the source), upon the following conditions:

(1) *Regional limitation.* The source shall comply with Kansas Air Pollution Emission Control Regulation 28-19-31A by November 30, 1977.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section, shall be in accordance with EPA Test Method 5.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39318, Sept. 15, 1976]

§ 55.371 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to The Kansas Power and Light Company, Tecumseh Station, Units 9 and 10, Tecumseh, Kansas (the source), upon the following conditions:

(1) *Regional limitation.* Units 9 and 10 shall comply with Kansas Air Pollution Emission Control Regulation 28-19-31A by December 31, 1977.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section, shall be in accordance with EPA Test Method 5.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39317, Sept. 15, 1976]

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§ 55.372 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to the Kansas City Board of Public Utilities, Kaw Station, Units K-1, 2015 Kansas, Kansas City, Kansas (the source), upon the following conditions:

(1) *Regional Limitation.* Units K-1 shall comply with KAPEC 28-19-31A by December 31, 1978, in accordance with the approved compliance plan.

(2) Test procedures to determine compliance with (a)(1) of this section, shall be in accordance with EPA Test Method 5.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 43904, Oct. 5, 1976, as amended at 43 FR 14471, Apr. 6, 1978]

§§ 55.373—55.389 [Reserved]

Subpart S—Kentucky

§§ 55.390—55.409 [Reserved]

Subpart T—Louisiana

§§ 55.410—55.429 [Reserved]

Subpart U—Maine

§§ 55.430—55.449 [Reserved]

Subpart V—Maryland

§ 55.450 Delayed compliance order.

The Administrator hereby issues a Delayed Compliance Order (DCO) to the Department of the Navy's Naval Ordnance Station, Indian Head, Maryland (NOSIH), Goddard Power Plant, Boilers Numbered 1, 2, and 3 (the source), upon the following conditions:

(a) Primary Standard Conditions:

(1) During the period this Order is in effect, the source shall not burn coal which results in the emission of particulate matter in excess of 250 pounds of particulate matter per hour per boiler.

(2) During the period this Order is in effect, the source shall burn only coal with an ash content less than 12 percent and a high heating value of greater than 12,000 British Thermal Units per pound.

(3) During the period this Order is in effect, the source shall not simultaneously operate Boilers Nos. 1, 2, and 3 at any time.

(4) Within 30 days of receipt of this Order, the NOSIH shall submit a proposal for a compiete air quality monitoring network to be set up by the NOSIH in the vicinity of the source as required by subparagraph VI.A.1. of the DCO.

(5) Within 90 days after receiving EPA approval of the proposed network, the NOSIH shall complete installation and begin operation of the air quality monitoring network.

(6) Within 90 days of receipt of this Order, the NOSIH shall submit for EPA approval the methods, procedures and devices the NOSIH intends to use to obtain the information required by subparagraph VI.B. of the DCO.

(b) Plan for Compliance with the Code of Maryland Air Pollution Regulations ("COMAR"). The source shall comply with COMAR 10.03.04.03B, 10.03.40.02D and 10.03.40.02C(2) in accordance with the following increments of compliance. In the event of a modification by the State of Maryland to any of the COMAR emission limitations set forth above, which is approved by EPA as a revision to the Maryland State Implementation Plan (SIP), compliance with the COMAR as modified in accordance with such revision to the SIP is required.

(1) March 1, 1982—Submit a plan for approval of the particulate emission control systems.

(2) July 1, 1982—Enter into contracts for the particulate emission control systems.

(3) October 1, 1982—Initiate on-site construction or installation of the particulate emission control systems.

(4) October 1, 1983—Complete on-site construction or installation of the particulate emission control systems for Boilers Nos. 1 and 2.

(5) January 1, 1984—Perform an emission test in accordance with 40 CFR Part 60, and visible emission observations in accordance with EPA

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Method 9 (40 CFR Part 60, Appendix A), and submit the reports demonstrating final compliance with the above emission limitations for Boilers Nos. 1 and 2.

(6) July 1, 1984—Complete on-site construction or installation of the particulate emission control system for Boiler No. 3.

(7) October 1, 1984—Perform emission test in accordance with 40 CFR Part 60, and visible emission observations in accordance with EPA Method 9 (40 CFR Part 60, Appendix A), and submit the reports demonstrating final compliance with the above emission limitations for Boiler No. 3.

(c) Interim Requirements: The source shall comply with the following interim requirements prior to achieving compliance with COMAR 10.03.04.03B, 10.03.40.02D and 10.03.40.02C(2).

(1) Within 60 days of commencing the use of coal in Boilers Nos. 1, 2, and 3, the NOSIH shall perform source tests for particulate emissions using EPA Method 5 as specified in Appendix A of Part 60, Title 40 of the Code of Federal Regulations, as amended. Furthermore, no later than March 1, 1983 the NOSIH shall perform additional particulate emission tests on Boiler No. 3. The NOSIH shall perform such tests in a manner prescribed by EPA Region III and shall provide EPA Region III a minimum of 15 days written notice prior to conducting such tests. The NOSIH shall provide a complete report containing all information pertinent to the performance and results of the stack tests within 45 days of completing such tests.

(2) Within 30 days of the effective date of this Order, the NOSIH shall install continuous opacity monitors in the stacks of Boilers Nos. 1, 2, and 3.

(3) Within 90 days of the effective date of this Order, the NOSIH shall conduct a Performance Specification Test (PST) in accordance with Performance Specification 1, Appendix B of Part 60, Title 40 of the Code of Federal Regulations. The NOSIH shall notify EPA Region III of the date on which the PST will be conducted at least 30 days prior to such date. Within 45 days of the PST, the NOSIH shall submit a complete report containing all information pertinent to the PST to EPA Region III.

(4) The NOSIH shall keep monthly records of both air quality monitoring data and air pollutant emissions and shall submit such records within 15 days of the end of each calendar month to EPA Region III. These records shall detail daily particulate emissions from Boilers Nos. 1, 2, and 3 and shall include for each unit:

(i) A description of the types and amounts of fuel consumed each day of the preceding month.

(ii) An analysis of the fuel received each week including sulfur content, ash content, and high heating values.

(iii) For the stacks serving Boilers Nos. 1, 2, and 3, a record of the hourly measurement of opacity acquired by means of a continuous opacity monitoring device.

(5) Within 30 days of the effective date of this Order, the NOSIH shall submit for EPA approval procedures by which the NOSIH will obtain and record data about the operating parameters of the multiclone collectors on each coal-fired boiler. Said procedures shall be implemented within 30 days after they are approved by EPA.

(6) Within 60 days of the effective date of this Order, and every six months thereafter, the NOSIH shall submit to EPA Region III a report that described the NOSIH's efforts during the reporting period to improve the performance of the multiclone collectors on Boilers Nos. 1, 2, and 3.

(7) The NOSIH shall notify EPA Region III of any exceedance of the National Primary Ambient Air Quality Standards within 72 hours of the collection of such data from its network.

(8) The NOSIH shall notify EPA Region III within 10 days after each incremental requirement has been satisfied, or within 10 days after the final date set for achieving each such requirement, if such requirement has not been achieved.

(9) The NOSIH shall also submit a copy of all correspondence and reports required under this Order to the State of Maryland's Air Management Administration.

(d) Violation of any requirement of this Order shall result in one or more of the following actions:

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(1) Enforcement of such requirement pursuant to Section 113(a), (b) or (c) of the Act, 42 U.S.C. 7413 (a), (b), or (c).

(2) Revocation of this Order, after notice and opportunity for public hearing and enforcement action.

(3) Notification of noncompliance and commencement of an action pursuant to Section 120 of the Act.

(4) An appropriate combination of such actions.

(e) Nothing herein shall affect the responsibility of the NOSIH to comply with any other applicable State, local, or other Federal law or regulation.

Any terms or conditions appearing in the Order and not contained herein shall remain in full force and effect notwithstanding.

(42 U.S.C. 7413(d))

[46 FR 53143, Oct. 28, 1981]

Subpart W—Massachusetts

§ 55.470 Delayed compliance order.

The Administrator hereby issues a Delayed Compliance Order on the following conditions.

(a) The sources shall comply with the following Primary Standard Conditions which will assure that particulate emissions from coal burning do not cause or contribute to violations of the national primary ambient air quality standards for suspended particulates.

(1) Coal burning particulate emissions (denoted by R in units of #/10^6 Btu heat input) as measured by EPA reference test methods shall not exceed the limits given by the following formulas, dependent on coal sulfur (S) and ash (A) percentages by weight (dry basis) rounded off to the nearest 0.1 percent at the time of stack testing:

(i) For $S < 0.8\%$

$$R = 0.0591 \times A$$

(ii) For $0.8\% \leq S < 1.0\%$

$$R = 0.0341 \times A$$

(iii) For $1.0\% \leq S < 1.3\%$

$$R = 0.0281 \times A$$

(iv) For $1.3\% \leq S$

$$R = 0.0215 \times A$$

(v) Particulate emissions from coal burning shall at no time exceed 0.75 #/10^6 Btu.

(2) The coal burned under this Order shall consist of:

(i) Coal supplies on the premises of the Brayton Point Generating Station as of October 1, 1979 (existing coal), and

(ii) Such new shipments of coal as NEPCO procures for use at the Brayton Point Generating Station (new coal) provided that all cargoes of new coal comply with State regulations on sulfur content and that no such cargo has an average ash content as received in excess of 10 percent by weight.

(b) The sources shall attain compliance with Regulations 7.05(4), 7.06, and 7.17 (for particulates) of the Southeastern Massachusetts Air Pollution Control District (SEMAPCD) no later than the dates specified in the following Compliance Schedules:

Unit 1	Unit 2	Increment of progress
Completed	Completed	Enter into contracts for additional or modified electrostatic precipitators.
Nov. 20, 1979	Nov. 20, 1979	Submit for approval to the Director of the EPA Region I Enforcement Division (the Director) contracts for additional or modified electrostatic precipitators necessary for coal burning in compliance with SEMAPCD Regulations.
Nov. 30, 1979	Nov. 30, 1979	Enter into contracts for coal unloading tower modifications and the purchase of induced draft fans and of ash handling equipment necessary for long-term coal burning by the sources.
Aug. 1, 1980	Aug. 1, 1980	Revert to residual oil firing for the purpose of refurbishing coal handling equipment. However for cause and with the written consent of the Director, the source may revert to residual oil firing for the purpose of refurbishing coal handling equipment no later than November 1, 1980. Thereafter, the sources shall burn no coal until additional electrostatic precipitator capacity has been installed.
July 1, 1981	Nov. 1, 1980	Initiate on-site construction or installation of electrostatic precipitators.
June 30, 1982	Dec. 31, 1981	Complete on-site construction or installation of electrostatic precipitators.

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Unit 1	Unit 2	Increment of progress
July 31, 1982	Jan. 31, 1982	Demonstrate compliance with SEMAPCD Regulations 7.05(4), 7.06, and 7.17 while burning coal.

Notwithstanding the above, not later than 90 days after recommencing coal burning, NEPCO must submit the results of emission tests performed in accordance with 40 CFR Part 60 demonstrating compliance with SEMAPCD Regulations 7.05(4), 7.06, and 7.17. At any time during the effective period of this Order, the Director may request and within fourteen (14) days shall receive a detailed written update from NEPCO on the progress of the long-term conversion of the sources to coal burning in compliance with SEMAPCD regulations.

(c) The sources shall comply with the following Interim Requirements which will assure compliance with SEMAPCD Regulations to the fullest extent reasonable and practicable. These Interim Requirements shall additionally avoid any imminent and substantial endangerment to the public health and will not preclude enforcement under section 303 of the Act when appropriate:

(1) Within thirty (30) days of initial coal burning in each unit under this Order, NEPCO shall have conducted particulate emission tests, in conjunction with those required by condition 4(c), for the purpose of proposing to the Director opacity limitations suitable for enforcement under this Order. These emission tests shall be conducted using methods and under conditions approved by EPA. Within fifteen (15) days of completing such tests NEPCO shall submit a written report to EPA including an analysis of test results supporting a proposed opacity limitation applicable to coal burning by the sources. The Director shall within fifteen (15) days of receipt of such test reports and analyses, determine an opacity limitation for enforcement under this Order. If test reports, a proposed opacity limitation, and an analysis supporting it, have not been submitted by NEPCO within forty-five (45) days of initial coal firing in each source, SEMAPCD Regulation 7.06 shall apply. EPA may, on its own initiative, require that NEPCO perform additional particulate emission testing for the express purpose of revising such opacity limits to reflect changing operating conditions or burning of new coal. NEPCO shall notify the Director in writing within five (5) days of the date on which each of the Ordered sources starts burning new coal. As a minimum a second set of particulate emission tests shall be performed within thirty (30) days, and reported on within forty-five (45) days, of the date each source starts burning new coal as determined by the Director.

(2) Within thirty (30) days of the date of effectiveness of this Order, NEPCO shall submit for approval a procedure acceptable to the Director for quantifying the contribution of coal burning particulate emissions by the sources to HiVol ambient particulate at samples. This procedure shall be based upon the chemical and physical characteristics of such HiVol samples and of fuel samples or samples from particulate emission tests. Within sixty (60) days of the date of effectiveness of this Order, and thereafter for its duration while the sources burn coal, NEPCO shall be prepared to apply this procedure to HiVol samples selected by EPA. Within thirty (30) days of notification by EPA, NEPCO shall submit a written report to the Director on the contribution in micrograms per cubic meter of coal burning particulate emissions to such HiVol samples.

(3) NEPCO shall provide the Director with seven (7) days prior written notice of the date on which each of the sources shall go off line in order to start coal burning under this Order. NEPCO shall also allow EPA to inspect the operating conditions of particulate emission controls on the Ordered sources both immediately after the units go off line and immediately before initial coal firing under this Order.

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(4) NEPCO shall install a flue gas conditioning system on each source before initial coal burning. Within thirty (30) days of initial coal burning NEPCO shall submit for approval by the Director a detailed program for minimizing particulate emissions by the continued proper operation and maintenance of these flue gas conditioning systems. Adherence by NEPCO to the requirements of this program shall be enforceable under this Order.

(d) The sources shall comply with the following Monitoring and Reporting Requirements to assure that primary standard conditions and interim requirements are met throughout the duration of this Order:

(1) NEPCO shall perform proximate analyses of all cargoes of new coal offloaded at the Brayton Point Generating Station and daily analyses for sulfur, moisture, ash, and high heating value for coal burned under this Order. Further, for the duration of this Order, NEPCO shall maintain records of coal cargo sizes, and coal analyses. Samples of coal as fired daily shall also be retained for ultimate or trace element analyses as necessary for compliance with condition 3(b). Sampling and analysis methods used to comply with these requirements shall be those proposed in writing to, and approved with any necessary revisions by, the Director.

(2) NEPCO shall continuously monitor and record emissions from the Ordered sources using methods and in a manner specified by the Director. Within fifteen (15) days of the date of the effectiveness of this Order, NEPCO shall submit to the Director a plan to implement such continuous emission monitoring, which as a minimum shall comply with the requirements of 40 CFR 51 Appendix P as revised with the written approval of the Director.

(3) Within thirty (30) days of initial coal burning by each source under this Order, NEPCO shall perform particulate emission tests using the reference methods of 40 CFR 60 under conditions approved by the Director in writing prior to initial coal burning. Within fifteen (15) days of the completion of such tests, NEPCO shall submit to the Director a full test report, detailing fuel analyses, percent of maximum operating capacity, operating condition of the electrostatic precipitators, opacity readings, chemical analyses of particulate emission samples collected, particulate emission rates, and other data pertinent to the test.

(4) NEPCO shall monitor and record ambient suspended particulate concentrations daily at a minimum of four (4) sites while the sources burn coal under this Order. Monitoring and recording of hourly ambient sulfur dioxide concentrations and of hourly windspeed and direction shall be performed as required by the Director. This monitoring network shall meet the requirements of 40 CFR 58, Ambient Air Quality Monitoring, Data Reporting, and Surveillance Provisions including Appendix B, Quality Assurance; Appendix C, Monitoring Methodolgy; and Appendix E, Probe Siting. Ambient air monitoring methods and site locations must be proposed in writing for approval by the Director within fifteen (15) days of the date of the effectiveness of this Order. The Director may make any necessary revisions to this monitoring plan and any such plan shall be applicable to the sources and enforceable under this Order.

(5) Reports of coal cargo shipment sizes, coal analyses, aerometric data and excess emissions (to include opacity) shall be submitted to the Director within fifteen (15) days of the close of each month in a format approved and/or revised by the Director. Aerometric data shall also be submitted quarterly in machine readable SAROAD format.

(6) All proposals, notifications, and reports required by this Order from NEPCO shall be addressed to:

Director, Enforcement Division, Region I, Environmental Protection Agency, 2103 J. F. Kennedy Federal Building, Boston, Massachusetts 02203, Attention: Air Compliance Clerk.

(e) NEPCO may, if it desires, assert a business confidentiality claim covering part or all of the information requested, in the manner described by 40 CFR Section 2.203(b). Information covered by such a claim will be dis-

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closed by EPA only to the extent, and by means of the procedures, set forth in 40 CFR Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, it may be made available to the public by EPA without further notice to NEPCO. NEPCO should read the above-cited regulations carefully before asserting a business confidentiality claim, since certain categories of information are not properly the subject of such a claim. For example, the Clean Air Act provides that "emission data" shall in all cases be made available to the public, see 42 U.S.C. 1857c-9(c).

(f) All federal, State, and local air pollution requirements applicable to the sources and not specifically relaxed or suspended by this Order shall remain in effect.

(g) Violation of any requirement of this Order shall result in one or more of the following actions:

(1) Enforcement of such requirement pursuant to subsection 113 (a), (b), or (c) of the Act, including possible judicial action for an injunction and/or penalties and in appropriate cases, criminal prosecution.

(2) Revocation of this Order, after notice and opportunity for a public hearing, and subsequent enforcement of SEMAPCD Regulations 7.05(4), 7.06, and 7.17.

(3) If such violation occurs on or after July 1, 1979, notice of noncompliance and subsequent action pursuant to Section 120 of the Act.

(42 U.S.C. 7413(d))

[44 FR 67987, Nov. 28, 1979]

§ 55.471 Federal administrative orders issued under Section 113(d)(5) of the Act.

FINDINGS

The Administrator of EPA (Administrator) makes the following findings:

(1) The Holyoke Water Power Company (HWPC) owns and operates the Mt. Tom Generating Station (Mt. Tom) located in Holyoke, Massachusetts.

(2) Mt. Tom is a major stationary source, having the potential to emit more than 100 tons per year of particulate and sulfur dioxide while using pollution control equipment.

(3) Currently, the single unit at Mt. Tom Burns residual oil.

(4) On June 30, 1977, the Federal Energy Administration issued a prohibition order under the Energy Supply and Environmental Coordination Act, 15 U.S.C. 791 *et seq.* (1974), which prohibited Mt. Tom from burning oil. Currently, the U.S. Department of Energy (DOE) is preparing an Environmental Impact Statement (EIS) which is required prior to issuance of a Notice of Effectiveness of the prohibition order.

(5) An implementation plan to regulate air pollution in Massachusetts has been approved by the Administrator of EPA under Section 110 of the Act, 42 U.S.C. 7410.

(6) 310 CMR 7.02(8) is part of the applicable State Implementation Plan (SIP) within the meaning of Section 113(d)(5) of the Act, 42 U.S.C. 7413(d)(5), and reads in pertinent part as follows:

No person owning, leasing, or controlling the operation of any fossil fuel utilization facility shall cause, suffer, allow, or permit emissions therefrom in excess of those emission limitations set forth in the following tables (0.12 lbs. of particulate per million Btu heat input).

(7) 310 CMR 7.05(4) is part of the applicable SIP within the meaning of Section 113(d)(5) of the Act, 42 U.S.C. 7413(d)(5), and reads in pertinent part as follows:

No person shall cause, suffer, allow, or permit the burning in the district (Pioneer Valley Air Pollution Control) of any fossil fuel containing an ash content in excess of nine percent (9%) by dry weight.

(8) 310 CMR 7.06(1) is part of the applicable SIP within the meaning of Section 113(d)(5) of the Act, 42 U.S.C. 7413(d)(5), and reads in pertinent part as follows:

(1) From Stationary Sources Other than Incinerators

(a) No person shall cause, suffer, allow, or permit the emission of smoke which has a shade, density, or appearance equal to or greater than No. 1 of the Chart (20%) for a period, or aggregate period of time in excess of six minutes during any one hour, provided that at no time during the said six minutes shall the shade, density, or appearance be equal to or greater than No. 2 of the Chart. (40%).

(9) EPA has determined that Mt. Tom will be unable to meet the requirements of 310 CMR 7.02(8), 7.05(4) and 7.06(1) if the unit converts to coal burning.

(10) Mt. Tom is located in the Hartford-New Haven-Springfield Interstate Air Quality Control Region where the violations of the annual primary National Ambient Air Quality Standard (NAAQS) for total suspended particulates (TSP) were recorded during calendar years 1977, 1978, and 1979. After public notice and a public hearing, EPA has determined that HWPC has made the necessary showing under section 113(d)(5)(D) of the Act, 42 U.S.C.

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7413(d)(5((D), that particulate emissions from coal burning will not significantly cause or contribute to primary NAAQS violations.

(11) The Administrator has determined that the emission limits, requirements respecting pollution characteristics of coal and other enforceable measures contained in the following Order are sufficient to assure that the burning of coal at Mt. Tom will not result in emissions which cause or contribute to concentrations of any air pollutant in excess of any primary NAAQS for such pollutant.

(12) The Administrator also has determined that the compliance schedule in the following order requires compliance with 310 CMR 7.02(8), 7.05(4) and 7.06(1) as expeditiously as practicable.

(13) Furthermore, the Administrator has determined that the Interim Requirements of the following Order require the best practicable systems of emission reduction to protect the public health and minimize noncompliance with 310 CMR 7.02(8), 7.05(4) and 7.06(1).

I. SIP LIMITATION

Under this Order, the Mt. Tom generating unit owned by Holyoke Water Power Company (HWPC) shall comply with the interim emissions limits, compliance schedules, and other enforceable requirements set forth in this Order. The emission limits contained in this Order are authorized only until HWPC can install the necessary pollution control equipment to achieve compliance with 310 CMR 7.02(8), 7.05(4) and 7.06(1) of the Massachusetts SIP while burning coal at Mt. Tom. The Order contains a compliance schedule which sets a final compliance date by which HWPC's Mt. Tom generating unit must achieve compliance with all requirements of the SIP.

II. INTERIM REQUIREMENTS

EPA has determined that the following interim requirements ensure that burning coal at Mt. Tom will not cause or contribute to primary violations of the NAAQS for TSP:

A. (1) Prior to burning coal at Mt. Tom, HWPC shall refurbish the existing dust collector to its original design specifications and install four new transformer-rectifier sets, as specified in HWPC's May 21, 1981 submittal to EPA.

(2) Not later than 15 days before initial burning of coal, HWPC shall notify EPA of the expected date that the dust collectors shall be refurbished for the purpose of EPA's conducting an inspection.

B. (1) Prior to initial burning of coal at Mt. Tom, HWPC shall install a flue gas conditioning system to enhance the collection efficiency of its electrostatic precipitator.

(2) The flue gas conditioning system shall be fully operational prior to emission testing on the source as required in II(E)(2) of this Order.

C. Not later than 7 days before initial burning of coal at Mt. Tom, HWPC shall submit to EPA written notice of the date it intends to start burning coal in the unit.

D. (1) Notwithstanding the requirements of II(D)(2) of this Order, HWPC shall burn coal at Mt. Tom with an ash content not in excess of 10% by weight (as received basis) for each shipment received.

(2) Within 240 days after initial burning of coal at Mt. Tom under this Order, HWPC shall burn coal at Mt. Tom with an ash content not in excess of 9% by weight (dry basis) for each shipment received.

(3) Coal shall be sampled for ash content according to the requirments of IV(B)(1) of this Order.

E. (1) Upon initial burning of coal at Mt. Tom, HWPC shall not emit particulate matter at a rate in excess of 0.480 pounds per million Btu gross heat input.

(2) HWPC shall conduct a particulate emission test on the unit within 45 days of initial burning of coal, to demonstrate compliance with this emission limit.

F. (1) Within 30 days after initial coal burning at Mt. Tom, HWPC shall submit to EPA a preliminary plan to optimize particulate emission reduction from operating the flue gas conditioning system.

(2) In addition, HWPC shall submit to EPA monthly status reports on the implementation of this plan.

G. (1) Within 120 days after initial coal burning, HWPC shall submit to EPA a final plan to optimize particulate emission reduction from operating the flue gas conditioning system. Upon approval by EPA, this final plan shall become enforceable under this Order.

(2) Within 150 days after initial burning of coal, HWPC shall conduct a particulate test on the unit in accordance with IV(A)(3) of this Order to demonstrate optimization of the flue gas conditioning system.

H. (1) Within 240 days after initial burning of coal at Mt. Tom under this Order, particulate emissions from the unit shall not exceed 0.350 pounds per million Btu gross heat input.

(2) HWPC shall conduct a particulate emission test on the unit within 240 days after initial burning of coal at Mt. Tom to demonstrate compliance with this emission limit.

I. Within 30 days after completing each set of particulate emission tests required by II(E) and (H) above, HWPC shall submit to EPA a report which correlates visible emissions as determined by EPA Method 9 (40 CFR Part 60, Appendix A) as a function of particulate emissions from coal burning.

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(1) Each report shall propose an enforceable visible emissions opacity limit for the unit.

(2) EPA shall set an opacity limit for enforcement under this Order within 30 days of receipt of each report. EPA may require HWPC to submit additional visible emissions data under IV(A)(5) of this Order, and may use the additional data to revise opacity limits applicable to coal burning under this Order.

(3) Each report also shall propose an opacity monitor reading which correlates with particulate emissions from coal burning.

(4) Within 30 days of receipt of each report, EPA shall set an opacity monitor reading which will be used as an indicator of continuous compliance with the emission limits of this Order.

J. Within 30 days of the effective date of this Order, HWPC shall submit for approval by EPA a detailed program for minimizing fugitive particulate emissions from coal and coal ash handling.

(1) This program shall include as a minimum, HWPC's commitment to install a telescoping dust chute at the discharge point of the coal pile loading conveyor prior to initial coal burning.

(2) This program, including an implementation schedule, shall become a fully enforceable term of the Order.

K. (1) Within 30 days of the effective date of this Order, HWPC shall submit to EPA a written plan detailing the specific activities it plans to conduct to meet the coal ash content requirement specified in II(D)(2) of this Order. The plan must also demonstrate that HWPC will not stockpile nonconforming coal for use after 240 days from the date of initial coal burning at Mt. Tom. Upon approval by EPA, this plan shall become enforceable under this Order.

(2) In addition, HWPC shall submit to EPA monthly status reports within 15 days of the end of each month on the implementation and results of this plan.

III. Compliance Schedule

A. HWPC shall comply as expeditiously as practicable with the requirements of 310 CMR 7.02(8) and 7.06(1) or any superceding Massachusetts regulations as approved by EPA. In no event, however, shall compliance be achieved later than the dates specified in the following compliance schedule:

(1) Not later than December 31, 1981, HWPC shall enter into contracts for the design, fabrication, and installation of particulate emission controls or other equipment which is necessary for the unit to achieve final compliance with 310 CMR 7.02(8) and 7.06(1) or any superceding Massachusetts regulations as approved by EPA prior to this date.

(2) Not later than January 31, 1983, HWPC shall initiate on-site construction for installation of the continuous particulate emission control systems.

(3) Not later than December 31, 1983, HWPC shall complete the installation of the continuous particulate emission control systems.

(4) Not later than February 15, 1984, or within 45 days of completing installation of the continuous particulate emission control systems, HWPC shall perform particulate emission tests to demonstrate compliance with 310 CMR 7.02(8) and 7.06(1) or such superceding Massachusetts regulations as approved by EPA.

B. HWPC shall submit to EPA, no later than 15 days after each calendar quarter, calendar quarterly reports which outline its progress in meeting all the compliance milestones listed above. The first such report is due April 15, 1982.

C. In the event HWPC is unable to comply with any of the schedule increments established in III(A) above, and such failure is due to an Act of God, war, strike, or other such causes beyond its control, HWPC may petition EPA to extend the time for compliance with such schedule increment and all subsequent schedule increments by a period equal to the delay caused by such circumstances. HWPC shall bear the burden of proving that a delay is caused by circumstances clearly beyond its control. Any delay that is caused by such circumstances shall not be deemed a violation of this Order. In no event, however, shall final compliance be achieved later than December 31, 1985.

IV. Monitoring and Reporting Requirements

A. Emissions Monitoring and Reporting Requirements

1. All particulate emission testing shall be conducted in accordance with Reference Method 5, 40 CFR Part 60, Appendix A, under operating conditions approved by EPA and in the presence of EPA personnel or EPA representatives.

(a) HWPC shall provide safe access to a safe sampling platform on the unit to be tested.

(b) For the purposes of this Order, a particulate emission test shall consist of four Method 5 sampling runs. One of the four runs shall be conducted during the normal boiler sootblowing cycle, and three runs shall be conducted without sootblowing.

(c) The average emission rate for a particulate emission test shall consist of the arithmetic average of the three non-sootblow runs prorated in a manner specified by EPA to account for the change in emission encountered during the sootblow run.

2. For any emission or performance specification testing under this Order:

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(a) HWPC shall submit a pretest report to EPA at least 30 days before the proposed test date for the unit.

(b) No fewer than 5 days before HWPC conducts any such test, EPA shall meet with appropriate HWPC personnel and any representatives of the contractor responsible for the performance of the tests to discuss and finalize the testing protocol.

(c) HWPC shall submit a written emission test report to EPA within 30 days of completing any EPA required emission testing.

(d) Pretest reports and emission test reports shall contain information as required by EPA and shall be presented in a format specified by EPA.

3. Within 150 days of initial burning of coal at Mt. Tom, HWPC shall perform emission tests on the unit as equipped with flue gas conditioning as follows:

(a) Two sets of tests shall be performed on the unit; one set while the flue gas conditioning system is operating, and one set while it is not operating.

(b) Each set of tests shall include:

(i) One particulate emission test of four runs conducted in accordance with EPA Method 5, 40 CFR Part 60, Appendix A.

(ii) At least 8 acid sulfate measurements in accordance with a method specified by EPA.

(iii) At least 8 sulfur dioxide measurements using EPA Method 6, 40 CFR Part 60, Appendix A.

(c) All acid sulfate and sulfur dioxide measurements shall be made during the approximate duration of the particulate testing.

(d) Each acid sulfate measurement shall be performed simultaneously with a sulfur dioxide measurement.

(e) The same type of coal shall be burned during both sets of tests.

(f) The boiler load, sootblowing operations and the amount of excess air shall be the same for both sets of tests.

(g) Both sets of tests shall be made while the unit and its electrostatic precipitator are operating under normal operating conditions.

(h) For any set of tests performed with flue gas conditioning, the flue gas conditioning system shall be operated in a manner specified by EPA.

(i) The tests with conditioning agents shall be preceded by at least 10 days of operation with conditioning agents to allow the precipitator to stabilize. Similarly, the tests without conditioning agents shall be preceded by at least 10 days of precipitator operation without conditioning agents.

(j) Each set of tests also shall be subject to the requirements of IV(A)(2) of this Order.

(k) If the approximate composition or usage rate of the conditioning agent changes at any time during the life of this Order, HWPC shall notify EPA in writing within 15 days of the change. If such change occurs after HWPC has performed the testing detailed above, EPA may require additional tests. If EPA decides to require such additional tests, HWPC shall be notified in writing. HWPC shall perform the additional tests within 30 days of receipt of the written notice.

4. HWPC shall install and operate continuous opacity monitoring equipment before burning coal in the unit.

(a) HWPC shall demonstrate that its opacity monitors comply with performance specifications within 30 days after initial burning of coal at Mt. Tom. HWPC shall comply with the provisions of 40 CFR Part 51, Appendix P, and the performance specification test requirements cross-referenced under 40 CFR Part 60, Appendix B. If two or more opacity monitors are used to report opacity from the boiler, HWPC shall submit to EPA for approval, an acceptable method for correlating each monitor to the total opacity at the stack outlet. HWPC shall notify EPA 10 days before removing any monitor from its location. This notification also shall include data which demonstrates that the new location for the monitor or its replacement meets the requirements of 40 CFR Part 60, Appendix B. Additionally, the monitor or its replacement shall be completely recertified according to 40 CFR Part 60, Appendix B before it is reinstalled. Data demonstrating recertification shall be provided to EPA upon request.

(b) Not later than 30 days prior to initial start-up of the continuous opacity monitoring equipment, HWPC shall submit to EPA an approvable quality assurance program for the monitoring system.

(c) HWPC shall report to EPA on a monthly basis in a format approved by EPA, all hourly average opacity readings for each opacity monitor which exceed the limits set by EPA under II (I) of this Order. These summary reports shall be submitted to EPA within 15 days of the end of each month; records of all hourly average opacity readings shall be retained at Mt. Tom for inspection for the duration of this Order. An explanation, if known, shall accompany each opacity exceedance.

B. Coal Monitoring and Reporting Requirements

Within 30 days of the effective date of this Order, HWPC shall submit an approvable fuel monitoring plan to EPA. As a minimum, such plan shall include a commitment on the part of HWPC to do the following:

1. HWPC shall perform proximate analyses of all coal cargoes off-loaded at Mt. Tom.

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(a) ASTM D 3172 shall be used for the performance of the proximate analyses.

(b) ASTM D 2234 sampling with systematic spacing shall be used for sample increment collection.

2. HWPC shall perform daily coal sampling and analyses for sulfur content, ash content, and gross calorific value for coal burned under this Order.

(a) ASTM D 2234 sampling with systematic spacing shall be used for sample increment collection.

(b) Table 2 of paragraph 7.1.5.2 of ASTM D 2234 shall be used to determine the minimum number of increments and the minimum weight of each increment. Such increments from all conveyors are to be composited for analysis on a daily basis.

(c) ASTM D 2103 shall be used for sample preparation.

(d) ASTM D 3177 shall be used for sulfur analysis.

(e) ASTM D 3174 shall be used for ash analysis.

(f) ASTM D 3173 shall be used for moisture analysis.

(g) ASTM D 3180 shall be used for calculating analyses on either a dry or as received basis.

(h) ASTM D 2015 or ASTM D 3286 shall be used for gross calorific value determinations.

3. HWPC shall participate in the EPA coal analysis methods audit program conducted by the Quality Assurance Division, Environmental Monitoring Systems Laboratory in Research Triangle Park, North Carolina. Coal audit samples shall be analyzed according to ASTM procedures for percent sulfur, moisture, ash content and gross calorific value and will be provided by EPA on a periodic basis.

4. Monthly reports containing coal cargo shipment sizes, coal cargo analyses, and daily coal analyses shall be submitted to EPA within 15 days of the close of each month in a format approved by EPA.

(a) Such reports also shall contain 30-day "rolling average" sulfur content values for the coal burned calculated for each day of the month.

(b) The results of any audit coal sample analyses performed during that month also shall be included.

(c) All coal analysis data will be presented on a dry basis.

5. HWPC shall submit to EPA on a monthly basis hourly average net megawatts generated for the unit. Monthly data shall be reported within 15 days of the end of each month in a format approved by EPA.

6. HWPC shall perform any additional testing required by EPA within 30 days of receipt of written notification of such requirement. Among other things, additional testing may be required to quantify changes in emissions due to such factors as changes in coal characteristics, or changes in boiler or precipitator operation.

Additional tests also may be required to quantify suspected changes in emissions indicated by frequent opacity exceedences. Any proposal made by HWPC to limit total station emissions by derating the generating unit may result in additional testing requirements for the unit at any proposed generation levels.

7. HWPC shall maintain a logbook available for inspection by EPA containing the following data for the electrostatic precipitator:

(a) HWPC shall log secondary voltage, secondary current, and spark rate every 4 hours while the unit is burning coal.

(b) HWPC shall log voltage current relationships across the transformer-rectifier set's operating range every 15 days for the first 60 days after initial burning of coal in the unit. Thereafter, the data shall be logged every 30 days for the duration of this Order.

C. Ambient Monitoring and Reporting Requirements

1. (a) Within 60 days of the effective date of this Order but in no case later than the start of coal burning and subject to the provisions of IV(C)(5) of this Order, HWPC shall install and operate a network of ambient monitors to measure sulfur dioxide (SO_2) concentration on a continuous basis, and TSP concentration on a frequency as specified in IV(C)(2) below.

(b) As a minimum, HWPC shall place monitors for the following pollutants near each of the locations specified below:

(i) Summit House, Skinner State Park bordering Hadley and South Hadley; TSP and SO_2.

(ii) Mt. Tom Range, approximately 0.6 km southwest of Summit House approximately 750 feet above mean sea level, bordering Hadley and South Hadley; SO_2. TSP will be required only if the SO_2 levels exeed the secondary NAAQS.

(iii) Northampton area, Northampton; TSP. SO_2 will be required only if the TSP levels exceed the secondary NAAQS.

(iv) Pine Street, South Hadley; TSP and SO_2.

(v) Mt. Tom ski area, Holyoke; SO_2.

(vi) Goat Peak, Mt. Tom Range, Holyoke; TSP and SO_2.

(vii) Mt. Tom coal pile (to measure fugitive impacts), Holyoke; TSP.

(viii) Mt. Tom stackbase, Holyoke; SO_2.

(c) The burning of coal at Mt. Tom under this Order constitutes acceptance by HWPC that ambient monitoring data collected on its property is representative of ambient air quality levels in the surrounding area. EPA

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may use this data for enforcement or any other purpose as such under the Act.

2. The sampling frequency at the Northampton and Pine Street TSP sites shall be once every three days. The sampling frequency at all the remaining TSP sites shall be daily; however, the sampling frequency at a TSP monitoring site may be reduced to once every three days if the following conditions are met at such site during any continuous 365 days period after coal has been burned at Mt. Tom:

(a) Every 24-hour TSP concentration measured at the site must be less than 200 micrograms per cubic meter, and;

(b) The annual geometric mean of TSP measured at the site must be less than 60 micrograms per cubic meter.

3. All ambient monitoring locations and equipment installations must be approved by EPA prior to operation and must meet 40 CFR Part 58, Appendix B (Quality Assurance), Appendix C (Ambient Air Quality Monitoring Methodology), and Appendix E (Probe Siting Criteria).

(a) All SO_2 analyzers are to be operated on the 0.5 ppm range unless ambient air quality levels exceed this concentration. If this case occurs, then any such instrument must be operated on the appropriate higher range.

(b) Within 30 days of the effective date of this Order, HWPC shall submit in writing to EPA an approvable quality control program.

(c) EPA will accept performance audits by the Massachusetts Department of Environmental Quality Engineering (DEQE) to satisfy the requirements for the quarterly accuracy audit (40 CFR Part 58, Appendix B, Section 3), but it will be HWPC's responsibility to provide independent performance audits for any calendar quarter not audited by DEQE.

4. Within 60 days of initial burning of coal, HWPC shall complete construction of two 10 meter meteorological towers and one 100 meter tower at Summit House, Goat Peak, and near Mt. Tom's stack, respectively, for the purpose of operating continuous monitoring instruments to measure wind speed and direction.

(a) The exact location of these towers shall be selected by HWPC and shall be approved by EPA in writing before the towers are constructed.

(b) All meteorological instrumentation shall comply with EPA requirements as specified in EPA Guideline 450/4-80-012.

(c) All meteorological monitoring procedures must be submitted to EPA for approval at least 30 days before they are implemented.

5. HWPC shall obtain all the necessary permits, easements or permissions necessary to locate the monitors and meteorological towers required by IV(C) (1) and (4) of this Order. EPA may grant time extensions for monitor siting, select alternative sites, or eliminate sites altogether. However, HWPC bears the burden of establishing that all reasonable efforts have been made to locate the monitors and towers at the sites specified in this Order and that a change in the sites is necessary.

6. HWPC shall receive permission in writing from EPA prior to conducting any further analysis of the TSP filters. HWPC must keep all TSP filters in a suitable condition for further analysis for a period of 12 months after termination of this Order. HWPC must supply any of these filters to EPA upon request for further analysis. If the Federal Reference method for total suspended particulates is modified or replaced during the period of this order, EPA reserves the right to require HWPC to modify or replace any or all existing particulate monitors.

7. All monitoring and meteorological data shall be submitted to DEQE within 30 days of the close of each month in machine readable SAROAD format.

(a) The data reported to DEQE will be for individual hourly observations of SO_2, wind speed, and direction, as well as daily averages for TSP.

(b) HWPC shall insure that EPA receives the above information within 90 days of the end of each calendar quarter.

(c) HWPC shall notify EPA of any exceedence to any Primary National Ambient Air Quality Standard within 48 hours of receiving such data.

(d) Within 30 days of the close of each month, HWPC shall submit to both EPA and the DEQE, Springfield Regional Office, one paper copy of all monitoring and meteorological data. This data will be maintained for public inspection at the EPA Regional Office, Boston, and the DEQE Regional Office, Springfield, during normal working hours.

(e) EPA may grant time extensions to the data reporting requirements for this section, but HWPC shall bear the burden of establishing that such extensions are necessary.

8. Within 30 days of the occurrence of any violation of the primary National Primary Ambient Air Quality Standard for total suspended particulates, HWPC shall submit to EPA, all relevant data under Section 113(d)(5)(D) (i) through (iii) of the Act.

V. General Requirements

A. This Order shall not be effective during any interval after EPA finds and notifies HWPC that (1) a National Primary Ambient Air Quality Standard for total suspended particulates is being exceeded in the Hartford-New Haven-Springfield Interstate AQCR and (2) HWPC has failed to prove that the requirements of Sections

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113(d)(5)(D) (i) through (iii) of the Act have been satisfied. During any such intervals, HWPC shall comply with 310 CMR 7.02(8), 7.05(4), and 7.06(1) or any superseding Massachusetts regulations as approved by EPA. If HWPC violates these regulations, it shall be subject to enforcement action under Section 113 of the Act.

B. Nothing herein shall affect the responsibility of HWPC to comply with any other applicable local, state or federal regulations.

C. HWPC shall submit a copy of all correspondence and reports required under this Order to the Director, Air and Waste Management Division, EPA, Region I, JFK Federal Building, Boston, MA 02203.

HWPC may assert a business confidentiality claim covering part or all of the information requested by this Order in the manner described by 40 CFR Part 2, Section 203(b). Information covered by such a claim will be disclosed by EPA only as set forth in 40 CFR Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, it may be made available to the public by EPA without further notice to HWPC. Certain categories of information are not properly the subject of such a claim.

For example, the Act provides that emission data shall in all cases be made available to the public. See 42 U.S.C. 7414(c).

D. HWPC is hereby notified that its failure to achieve final compliance at Mt. Tom with 310 CMR 7.02(8) and 7.06(1) by the final compliance date specified in III(A)(4) of this Order may result in an assessment of a noncompliance penalty under Section 120 of the Act, 42 U.S.C. 7240. This penalty may be imposed at an earlier date, as provided under Section 113(d) and Section 120 of the Act, in the event that this Order is terminated or violated as provided in V (E) and (F) below. In either event, HWPC will be formally notified of its noncompliance, under Section 120(b)(3) of the Act or any regulations promulgated thereunder.

E. This Order shall be terminated in accordance with Section 113(d)(8) of the Act if the Administrator determines, on the record, after notice and opportunity for hearing, that the inability of HWPC to comply with 310 CMR 7.02(8) and 7.06 as approved by EPA, no longer exists with respect to its Mt. Tom generating unit. Additionally, if HWPC demonstrates compliance with 310 CMR 7.02(8) and 7.06 prior to the final compliance date specified in III(A)(4) of this Order, then this Order shall be terminated at that earlier date.

F. Violation of any requirement of this Order shall result in one or more of the following actions:

1. Enforcement of such requirement under Section 113 (a), (b), or (c) of the Act, 42 U.S.C. 7413 (a), (b), or (c);

2. Revocation of this Order, after notice and opportunity for a public hearing;

3. Notification of noncompliance and assessment of a noncompliance penalty under Section 120 of the Act, 42 U.S.C. 7420.

G. The information requests contained in this DCO are not subject to the approval requirements of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.*

H. This order is effective November 24, 1981 and after having received concurrence from the Governor of the Commonwealth of Massachusetts.

Dated: November 17, 1981.

ANNE M. GORSUCH,
Administrator, Environmental Protection Agency.

DELAYED COMPLIANCE ORDER—MT. TOM GENERATING STATION WAIVER OF RIGHTS TO CHALLENGE ORDER

Holyoke Water Power Company (the "Company"), by the duly authorized undersigned, hereby consents to the findings made and to the terms of this Order and waives any and all rights under provision of law to challenge this Order; however, the Company expressly reserves the right to assert any defense or to seek such other relief (other than an appeal from the issuance of this Order and the findings contained therein) as may be available to the Company in any enforcement action or other action taken pursuant to this Order or otherwise.

Dated: October 27, 1981.

WALTER F. TORRANCE, JR.,
Senior Vice President.

(42 U.S.C. 7413(d))

[46 FR 57493, Nov. 24, 1981]

§ 55.472 Federal administrative orders issued under Section 113(d)(5) of the Act.

FINDINGS

The Administrator of EPA (Administrator) makes the following findings:

1. New England Power Company (NEPCO) owns and operates the Salem Harbor Generating Station (Salem Harbor) located in Salem, Massachusetts.

2. Salem Harbor is a major stationary source, having the potential to emit more than 100 tons per year of particulates and sulfur dioxide (SO_2) while using pollution control equipment.

3. Currently, units 1, 2 and 3 at Salem Harbor burn residual oil.

4. On April 3, 1980, the U.S. Department of Energy (DOE) published a proposed order under the Powerplant and Industrial Fuel Use Act (FUA), 42 U.S.C. 8301 *et seq.*,

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which would prohibit units 1, 2 and 3 from burning oil. On June 10, 1981, DOE published a Notice of Intent to Proceed on the Salem Harbor Prohibition Order (46 FR 30682).

5. A state implementation plan (SIP) to regulate air pollution in Massachusetts has been approved by the Administrator of EPA under Section 110 of the Act, 42 U.S.C. 7410.

6. 310 CMR 7.02(8), which concerns emission limitations, is part of the applicable SIP within the meaning of Section 113(d)(5) of the Act and reads in pertinent part as follows:

> No person owning, leasing, or controlling the operation of any fossil fuel utilization facility shall cause, suffer, allow, or permit emissions therefrom in excess of those emission limitations set forth in the following tables * * * [0.12 lbs. of particulate per million Btu heat input].

7. 310 CMR 7.05(4), which concerns ash content of fuels, is part of the applicable SIP within the meaning of section 113(d)(5) of the Act and reads in pertinent part as follows:

> (b) No person shall cause, suffer, allow or permit the burning in the District [Boston Metropolitan] of any fossil fuel containing an ash content in excess of nine per cent (9%) by dry weight.

8. 310 CMR 7.06(1), which concerns visible emissions, is part of the applicable SIP within the meaning of section 113(d)(5) of the Act and reads in part as follows:

> (a) No person shall cause, suffer, allow, or permit the emission of smoke which has a shade, density, or appearance equal to or greater than No. 1 of the Chart [20%] for a period, or aggregate period of time in excess of six minutes during any one hour, provided that at no time during the said six minutes shall the shade, density, or appearance be equal to or greater than No. 2 of the Chart. [40%].

9. EPA has determined that units 1, 2 and 3 will be unable to meet the requirements of 310 CMR 7.02(8), 7.05(4) and 7.06(1) if the units convert to coal burning.

10. Salem Harbor is located in the Metropolitan Boston Air Quality Control Region (AQCR). The city of Salem is located within this AQCR and EPA has designated Salem as an area which is attaining the primary national ambient air quality standard (NAAQS) for total suspended particulates (TSP).

11. The Administrator has determined that the emission limits, requirements respecting pollution characteristics of coal and other enforceable measures contained in the following Order are sufficient to assure that the burning of coal at Salem Harbor will not result in emissions which cause or contribute to concentrations of any air pollutant in excess of any primary NAAQS for such pollutant.

12. The Administrator also has determined that the compliance schedule in the following Order requires compliance with 310 CMR 7.02(8), 7.05(4) and 7.06(1) as expeditiously as practicable and before December 31, 1985.

13. Furthermore, the Administrator has determined that the interim requirements of the following Order require the best practicable systems of emission reduction (BPSER) to protect the public health and minimize noncompliance with 310 CMR 7.02(8), 7.05(4) and 7.06(1).

Based on the foregoing findings, it is hereby ordered:

I. SIP Limitation

As specified in this Order, units 1, 2 and 3 of the Salem Harbor Generating Station owned by NEPCO shall comply with the interim limitations, compliance schedules, and other enforceable requirements set forth in this Order. The emission limits contained in this Order are authorized only until NEPCO can install the pollution control equipment necessary to achieve compliance with Sections 310 CMR 7.02(8), 7.05(4), and 7.06(1) of the Massachusetts SIP while burning coal at Salem Harbor. These regulations govern particulate emissions, coal ash content and visible emissions, respectively.

As used in this Order, the term "old coal" means the high ash (over 17%) coal on site at Salem Harbor before April 15, 1981, when NEPCO petitioned EPA to allow coal burning at the plant. "New coal" as used in this Order, refers to coal which complies with the 9% ash limit of 310 CMR 7.05(4) (interpreted by the state as measured on a cargo received basis).

II. Interim Requirements

EPA has determined that the following interim requirements ensure that the burning of old or new coal in units 1, 2 and 3 will not cause or contribute to violations of the primary NAAQS for TSP:

A. Preliminary and General Measures

1. Prior to the burning of any coal at Salem Harbor, NEPCO shall submit to EPA a detailed program for minimizing fugitive particulate emissions from coal and coal ash handling. Upon approval by EPA, this program shall become enforceable under this Order.

2. (a) Prior to the burning of old coal in any unit Salem Harbor, NEPCO shall install a flue gas conditioning system in that unit to enhance the collection efficiency of its electrostatic precipitator. This flue gas conditioning system shall remain in operation when the unit converts to burning new coal.

(b) Prior to the burning of new coal in a second unit at Salem Harbor, NEPCO shall

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install another flue gas conditioning system in that unit. This second flue gas conditioning system shall be supplied by a different vendor than the one that supplied the system required by (a) above.

(c) Prior to the burning of new coal in the third unit at Salem Harbor, NEPCO shall install a flue gas conditioning system in that unit. This third flue gas conditioning system may be supplied by any vendor.

(d) Within 180 days after initial burning of old coal at Salem Harbor, NEPCO shall evaluate the effectiveness of the flue gas conditioning systems, shall select the more effective system, and shall install the more effective system on all three units. In the event that the systems are ineffective, EPA may eliminate the requirement for installation and operation of the system.

(e) For the duration of this Order, the selected flue gas conditioning systems shall be operated in a manner recommended by the supplier of the conditioning agents.

3. (a) Within 180 days after initial burning of old coal at Salem Harbor, NEPCO shall complete implementation of all measures identified as best practical system of emission reduction of NEPCO's September 24, 1981 submittal to EPA, summarized as items 1-10 in Figure 12 of the testimony of G. P. Sasdi.

(b) Within 210 days after initial burning of old coal at Salem Harbor, NEPCO shall submit to EPA for approval a plan which details any corrective measures NEPCO intends to implement as a result of gas flow distribution tests (Item 7 in Figure 12). NEPCO shall be required to implement corrective measures if tests show that the existing gas flow distribution significantly decreases the effectiveness of the electrostatic precipitators. Upon approval by EPA, the terms of the above plan shall become enforceable under this Order.

4. (a) Within 30 days after initial burning of old coal at Salem Harbor, NEPCO shall submit to EPA a preliminary plan to optimize particulate emission reduction from operating the flue gas conditioning system or systems.

(b) In addition, NEPCO shall submit to EPA monthly status reports on the implementation of this plan.

(c) Within 210 days after initial burning of old coal at Salem Harbor, NEPCO shall conduct particulate emission tests on each unit to demonstrate optimization of the flue gas conditioning systems.

(d) Within 210 days after initial burning of old coal at Salem Harbor, NEPCO shall submit to EPA for approval a plan for installing any additional new transformer-rectifier sets. NEPCO shall be required to install additional new transformer-rectifier sets if flue gas conditioning optimization tests show that flue gas conditioning significantly enhances the effectiveness of the electrostatic precipitators. Upon approval by EPA, the terms of the above plan shall become enforceable under this Order.

(e) Within 240 days after initial burning of old coal, NEPCO shall submit to EPA a final plan to optimize particulate emission reduction from operating the flue gas conditioning system. Upon approval by EPA, this final plan shall become enforceable under this Order.

B. *Old Coal Burn*

1. Not later than 14 days before burning old coal in any unit, NEPCO shall submit to EPA written notice of the date it intends to start burning old coal in that unit.

2. (a) NEPCO shall be authorized to burn old coal for no more than 60 actual days of coal burning following the effective date of this Order, and not later than July 31, 1982.

(b) NEPCO shall burn old coal during this period only in either unit 2 or unit 3, but not in both units at the same time.

(c) During this time, unit 1 shall not burn any coal.

3. For the 60 days of burning of old coal under this Order, net electric power generation from coal burning shall not exceed the following rates:

(a) Unit 2: 64 MW

(b) Unit 3: 100 MW

Compliance with this limitation shall be based upon the monitoring and reporting required by IV(B)(5) of this Order.

4. For the 60 days of burning of old coal under this order, no unit shall burn coal at any time unless all fields of its electrostatic precipitator are fully energized and operating properly. Compliance with this requirement shall be verified by electrostatic precipitator records kept as required by IV(A)(6) of this order.

C. *New Coal Burn*

1. Not later than 14 days before burning new coal in any unit, NEPCO shall submit to EPA written notice of the date it intends to start burning new coal in that unit.

2. (a) Upon initial burning of new coal in any unit, particulate emissions from that unit shall not exceed 0.60 pounds per million Btu gross heat input.

(b) Within 60 days of initial burning of new coal in any unit, and not later than 150 days from the initial burning of any coal at Salem Harbor, NEPCO shall conduct particulate emission tests on that unit to demonstrate compliance with this emission limit.

3. (a) Within 240 days of initial burning of any coal at Salem Harbor under this Order, particulate emissions from each unit shall not exceed 0.45 pounds per million Btu gross heat input.

(b) Within 240 days of initial burning of any coal at Salem Harbor, NEPCO shall

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conduct a particulate emission test on each unit to demonstrate compliance with this emission limit.

(c) Eighteen months after completing (b) above, NEPCO shall conduct an additional particulate test on each unit to demonstrate continued compliance with the emission rate.

4. Within 30 days of completing each set of particulate emission tests required by II(C)(3), NEPCO shall submit to EPA a report which correlates visible emissions from each unit as determined by EPA Method 9 (40 CFR Part 60, Appendix A) as a function of particulate emissions from coal burning.

(a) Each report shall propose an enforceable visible emissions opacity limit for each unit covered by this Order.

(b) EPA shall set an opacity limit for enforcement under this Order within 30 days of receipt of each report.

(c) Each report also shall propose an opacity monitor reading which correlates with particulate emissions from coal burning.

(d) Within 30 days of receipt of each report, EPA shall set an opacity monitor reading which will be used as an indicator of continuous compliance with the emission limits of this Order.

(e) EPA may require NEPCO to submit additional visible emission analyses under IV(A)(5) of this Order, and may use the additional data to revise opacity limits applicable to coal burning under this Order.

III. Compliance Schedule

Before commencing the burning of old coal under this Order, NEPCO shall continue to comply at all times with 310 CMR 7.02(8), 7.05(4), and 7.06(1). Once the burning of old coal has commenced, NEPCO shall proceed as expeditiously as practicable to achieve compliance with 310 CMR 7.02(8), 7.05(4), and 7.06(1).

A. Increments of Progress

NEPCO shall achieve the following increments of progress towards final compliance no later than the earlier of the times specified in the following compliance schedule:

Compliance Schedule and Increment of Progress

1. Prior to the initial burning of old coal in any unit, or May 31, 1982—Hire an architect/engineer for coal conversion project design and engineering.
2. 2 months after initial burning of old coal in any unit, or July 31, 1982—Attain compliance with 310 CMR 7.05(4). (Compliance shall be determined from reports and fuel analyses required under (IV)(B) of this Order.)
3. 9 months after initial burning of old coal in any unit, or February 28, 1983—Enter contracts or place purchase orders for all major equipment including electrostatic precipitators, and ductwork, necessary for final compliance with 310 CMR 7.02(8) and 7.06(1).
4. 21 months after initial burning of old coal in any unit, or February 28, 1984—Initiate on-site construction or installation of electrostatic precipitators and ductwork.
5. (a) 31 months after initial burning of old coal in any unit, or December 31, 1984—Tie unit 1 into its completed electrostatic precipitator and ductwork.

(b) 35 months after initial burning of old coal in any unit, or April 30, 1985—Tie unit 2 into its completed electrostatic precipitator and ductwork.

(c) 39 months after initial burning of old coal in any unit, or August 31, 1985—Tie unit 3 into its completed electrostatic precipitator and ductwork.

6. (a) 34 months after initial burning of old coal in any unit, or March 31, 1985—Perform an emission test demonstrating compliance of unit 1 with 310 CMR 7.02(8) and 7.06(1).

(b) 38 months after initial burning of old coal in any unit, or July 31, 1985—Perform an emission test demonstrating compliance of unit 2 with 310 CMR 7.02(8) and 7.06(1).

(c) 43 months after initial burning of old coal in any unit, or December 31, 1985—Perform an emission test demonstrating compliance of unit 3 with 310 CMR 7.02(8) and 7.06(1).

B. Force Majeure

In the event NEPCO is unable to comply with any of the schedule increments established in III(A) above, and such failure is due to an act of God, war, strike, or other causes beyond its control, NEPCO may petition EPA to extend the time for compliance with such schedule increment and all subsequent schedule increments by a period equal to the delay caused by such circumstances. NEPCO shall bear the burden of proving that a delay is caused by circumstances clearly beyond its control. Any delay caused by such circumstances shall not be deemed a violation of this Order. In no event, however, shall final compliance be achieved later than December 31, 1985.

C. Compliance Reporting Requirements

1. NEPCO shall submit written notice of its compliance status with each of the above listed compliance milestones within 10 calendar days after the date for achieving such milestones.

2. If noncompliance is reported, notification should include the following information:

(a) A description of the noncompliance;

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(b) A description of any actions taken or proposed by NEPCO to comply with the elapsed schedule requirements;

(c) A description of any factors which tend to explain or mitigate the noncompliance;

(d) An approximate date by which NEPCO will perform the required action.

3. Furthermore, NEPCO shall submit calendar quarterly construction progress reports to EPA for the duration of this Order.

IV. Monitoring and Reporting Requirements

A. Emissions Monitoring and Reporting Requirements

1. All particulate emission testing shall be conducted in accordance with Reference Method 5, 40 CFR Part 60, Appendix A, under operating conditions approved by EPA and in the presence of EPA personnel or EPA representatives.

(a) NEPCO shall provide safe access to safe sampling platforms on all units to be tested.

(b) For the purposes of this Order, a particulate emission test shall consist of four Method 5 sampling runs. If NEPCO chooses to sootblow its boilers continuously as its normal mode of boiler operation, then each sampling run shall be conducted under continuous sootblow. If NEPCO chooses not to sootblow continuously, however, then one of the four sampling runs shall be conducted during the normal boiler sootblowing cycle, and three runs shall be conducted without sootblowing.

(c) The average emission rate for a particulate emission test shall consist of the arithmetic average of the three nonsootblow runs prorated in a manner specified by EPA to account for the change in emissions encountered during the sootblow run.

2. For all particulate emission tests required by II(A)(4)(c) of this Order, the following additional requirements shall apply:

(a) Two sets of tests shall be performed on each unit; one set while the flue gas conditioning system is operating, and one set while it is not operating.

(b) The same type of coal shall be burned during both sets of tests.

(c) The boiler load, sootblowing operations and the amount of excess air shall be the same for both sets of tests.

(d) Both sets of tests shall be made while the unit and its electrostatic precipitator are operating under normal operating conditions.

(e) The tests with conditioning agents shall be preceded by at least 10 days of operation with conditioning agents to allow the precipitator to stabilize. Similarly, the tests without conditioning agents shall be preceded by a period of precipitator operation without conditioning agents, as specified by EPA.

(f) After the flue gas conditioning systems have been optimized on new coal, if the approximate composition or usage rate of the conditioning agent changes at any time during the life of this Order, NEPCO shall notify EPA in writing within 15 days of the change. If such change occurs after NEPCO has performed the testing detailed above, EPA may require additional tests. If EPA decides to require additional tests, NEPCO shall be notified in writing. NEPCO shall perform the additional tests within 30 days of receipt of the written notice.

3. For any emission or performance specification testing under this Order:

(a) NEPCO shall submit a pretest report to EPA at least 30 days before the proposed test date for any unit.

(b) No fewer than 5 days before NEPCO conducts any such test, appropriate NEPCO personnel and any representatives of the contractor responsible for the performance of the tests shall meet with EPA to discuss and finalize the testing protocol.

(c) NEPCO shall submit a written emission test report to EPA within 30 days of completing any EPA required emission testing.

(d) Pretest reports and emission test reports shall contain information as required by EPA and shall be presented in a format specified by EPA.

4. NEPCO shall install and operate continuous opacity monitoring equipment on each unit before burning new coal in that unit.

(a) NEPCO shall demonstrate that each opacity monitor complies with performance specifications within 30 days after coal is burned in the unit on which the monitor is installed. NEPCO shall comply with the provisions of 40 CFR Part 51, Appendix P, and the performance specification test requirements cross-referenced under 40 CFR Part 60, Appendix B. If two or more opacity monitors are used to report opacity from any single boiler, NEPCO shall submit to EPA prior to conducting performance specifications tests for the monitors, an approvable method for correlating each monitor to the total opacity at the stack outlet at any time after the effective date of this Order. NEPCO shall notify EPA 10 days before removing any monitor from its location. This notification also shall include data which demonstrates that the new location for the monitor or its replacement meets the requirements of 40 CFR Part 60, Appendix B. Additionally, the monitor or its re-

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placement shall be completely recertified according to 40 CFR Part 60, Appendix B before it is reinstalled. Data demonstrating recertification shall be provided to EPA upon request.

(b) Not later than 30 days prior to initial start-up of the continuous opacity monitoring equipment, NEPCO shall submit to EPA an approvable quality assurance program for the monitoring system.

(c) NEPCO shall report to EPA on a monthly basis all hourly average opacity readings for each opacity monitor which exceed the limits specified by EPA under II(c)(4) of this Order. These summary reports shall be submitted to EPA within 15 days of the end of each month; records of all hourly average opacity readings shall be retained at Salem Harbor for inspection for the duration of this Order.

5. NEPCO shall perform any additional testing required by EPA within 30 days of receipt of written notification of such requirement. Among other things, additional testing may be required to quantify changes in emissions due to such factors as changes in coal characteristics or changes in boiler or precipitator operations. Additional tests also may be required to quantify suspected changes in emissions indicated by frequent opacity exceedences. Any proposal made by NEPCO to limit total station emissions by derating one or more generating units may result in additional testing requirements for that unit or units at any proposed generation levels.

6. NEPCO shall maintain a logbook available for EPA inspection containing the following data for each electrostatic precipitator serving a unit burning old or new coal under this Order.

(a) NEPCO shall log secondary voltage, secondary current, and spark rate for each transformer-rectifier set every 4 hours while the unit is burning old or new coal.

(b) NEPCO shall log voltage current relationships across each transformer-rectifier set's operating range every 15 days for the first 60 days after initial burning of old coal. Thereafter the data shall be logged every 30 days for the duration of this Order.

B. Coal Monitoring and Reporting Requirements

Within 30 days of the effective date of this Order, NEPCO shall submit an approvable fuel monitoring plan to EPA. As a minimum, such plan shall include a commitment on the part of NEPCO to do the following:

1. NEPCO shall perform proximate analyses of all coal cargoes off-loaded at the Salem Harbor Generating Station.

(a) ASTM D 3172 shall be used for the performance of the proximate analyses.

(b) ASTM D 2234, with systematic spacing shall be used for sample increment collection.

(c) Paragraph 7.1.5.2 and Table 2 of ASTM D 2234 shall be used to determine the number and weight of increments required per gross sample.

(d) One gross sample shall be collected for each shipment or for each 10,000 tons of coal, whichever is less.

2. NEPCO shall perform daily coal sampling and analyses for sulfur content, ash content and gross calorific value for coal burned at the station under this Order.

(a) ASTM D 2234, with systematic spacing shall be used for sample increment collection.

(b) As a minimum, one increment shall be collected from each coal conveyor during each hour that an individual conveyor is in operation. Such increments from all conveyors are to be composited for analysis on a daily basis.

(c) Table 2 of ASTM D 2234 shall be used to determine the weight of each increment.

(d) ASTM D 2013 shall be used for sample preparation.

(e) ASTM D 3177 or an equivalent method approved by EPA shall be used for sulfur analysis.

(f) ASTM D 3174 shall be used for ash analysis.

(g) ASTM D 2015 or ASTM D 3286 shall be used for gross calorific value determinations.

3. NEPCO shall participate in the EPA coal analysis methods audit program conducted by the Quality Assurance Division, Environmental Monitoring Systems Laboratory in Research Triangle Park, North Carolina. Coal audit samples shall be analyzed according to ASTM procedures for percent sulfur, moisture, ash content and gross calorific value and will be provided by EPA on a periodic basis.

4. Monthly reports containing coal cargo shipment sizes, coal analyses, cargo and daily coal analyses shall be submitted to EPA within 15 days of the close of each month in a format approved by EPA.

(a) Such reports also shall contain 30-day "rolling average" sulfur content values for the coal burned, calculated for each day of the month.

(b) The results of any audit coal sample analyses performed during that month also shall be included.

(c) All coal analysis data shall be presented on a dry basis.

5. NEPCO shall submit to EPA on a monthly basis, hourly average net megawatts generated by each unit. Monthly data shall be reported within 15 days of the end of each month in a format approved by EPA.

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C. Ambient Monitoring and Reporting Requirements

1. (a) Within 60 days of the effective date of this Order but in no case later than the start of coal burning and subject to the provisions of IV(C)(5) of the order, NEPCO shall install and operate a network of ambient monitors to measure SO_2 concentration on a continuous basis, and TSP concentration on a frequency as specified in IV(C)(2) below.

(b) As a minimum, NEPCO shall place both TSP and SO_2 monitors near each of the following locations:

(i) Water Tower, Green Street, Marblehead

(ii) Winter Island Dam, Salem

(iii) NEPCO right-of-way, north of Fort Avenue, Salem

(iv) NEPCO property southeast of Derby and English Streets

(v) Beverly north of Mackerel Cove

(c) The burning of coal at Salem Harbor under this order constitutes acceptance by NEPCO that ambient monitoring data collected on its property is representative of ambient air quality levels in the surrounding area. EPA may use this data as such for any purpose appropriate under the Act.

2. The sampling frequency at the Green Street, Marblehead and Beverly TSP sites shall be once every three days unless an exceedence of the secondary NAAQS for TSP is measured. In this event, daily sampling is required. The sampling frequency at all the remaining TSP sites shall be daily; however, the sampling frequency at any TSP monitoring site may be reduced to once every three days if the following conditions are met at such site during any continuous 365 day period after new coal has been burned at all three units:

(a) Every 24-hour TSP concentration measured at the site must be less than 200 micrograms per cubic meter and;

(b) The annual geometric mean for TSP measured at the site must be less than 60 micrograms per cubic meter.

3. All ambient monitoring locations and equipment installations must be approved by EPA prior to operation and must meet 40 CFR Part 58, Appendix B (Quality Assurance), Appendix C (Ambient Air Quality Monitoring Methodology), and Appendix E (Probe Siting Criteria).

(a) All SO_2 analyzers are to be operated on the 0.5 ppm or 1.0 ppm ranges unless ambient air quality levels exceed this concentration. If this case occurs, then any such instrument must be operated on the appropriate higher range.

(b) Within 30 days of the effective date of this Order, NEPCO shall submit in writing to EPA an approvable quality control program.

(c) EPA will accept performance audits by the Massachusetts Department of Environmental Quality Engineering (DEQE) to satisfy the requirements for the quarterly accuracy audit (40 CFR Part 58, Appendix B, Section 3), but it will be NEPCO's responsibility to provide independent performance audits for any calendar quarter not audited by DEQE.

4. Within 60 days of the effective date of this Order, NEPCO shall construct a meteorological tower at a location near the company right of way north of Fort Avenue.

(a) NEPCO shall operate continuous monitoring instruments on this tower to measure and record wind speed and direction.

(b) The exact location and height of the tower shall be selected by NEPCO and approved by EPA in writing before the tower is constructed.

(c) All meteorological instrumentation shall comply with EPA requirements as specified in EPA Guideline 450/4-80-012.

(d) All meteorological monitoring procedures must be submitted to EPA for approval at least 30 days before they are implemented.

5. NEPCO shall obtain all the necessary permits, easements or permissions necessary to locate the monitors and meteorological towers required by IV(C)(1) and (4) of this Order. EPA may grant time extensions for monitor siting, select alternative sites, or eliminate sites altogether, but NEPCO shall bear the burden of establishing that a change is necessary.

6. NEPCO shall receive permission in writing from EPA prior to conducting any further analysis of the TSP filters. NEPCO must keep all TSP filters in a suitable condition for further analysis for a period of 12 months after termination of this order. NEPCO must supply any of these filters to EPA upon request for further analysis. If the Federal Reference method for total suspended particulates is modified or replaced during the period of this Order, EPA reserves the right to require NEPCO to modify or replace any or all existing particulate monitors.

7. All monitoring and meteorological data shall be submitted to DEQE within 30 days of the close of each month in machine-readable SAROAD format.

(a) The data reported to DEQE shall be for individual hourly observations of SO_2, wind speed, and direction, as well as daily averages for TSP.

(b) NEPCO shall insure that EPA receives the above information within 90 days of the end of each calendar quarter.

(c) NEPCO shall notify EPA of any exceedence of any primary NAAQS for SO_2 within 72 hours of its occurrence.

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NEPCO shall notify EPA of any exceedence to any primary NAAQS for TSP within 15 days of its occurrence.

(d) Within 30 days of the close of each month, NEPCO shall submit to both EPA and the DEQE, Northeast Regional Office, Woburn, one paper copy of all monitoring and meteorological data. This data will be maintained for public inspection at the EPA Regional Office, Boston, and the DEQE Regional Office, Woburn, during normal working hours.

(e) EPA may grant time extensions to these reporting requirements for this Section, but NEPCO shall bear the burden of establishing that extensions are necessary.

8. Within 30 days of the occurrence of any violation of the primary NAAQS for TSP, NEPCO shall submit to EPA all relevant data under Section 113(d)(5)(D)(i) through (iii) of the Act.

V. General Requirements

A. This Order shall not be effective during any interval after EPA finds, and notifies NEPCO, that (1) a primary NAAQS for TSP is being exceeded in the Metropolitan Boston AQCR (Section 113(d)(5)(D)), and (2) NEPCO has failed to prove that the requirements of Sections 113(d)(5)(D)(i) through (iii) of the Act have been satisfied. During any such intervals, NEPCO shall comply with 310 CMR 7.02(8), 7.05(4) and 7.06(1). If NEPO violates these regulations, it shall be subject to enforcement action under any and all authorities of the Act.

B. Nothing herein shall affect the responsibility of NEPCO to comply with any applicable local, state or federal regulations except as specified in this Order.

C. NEPCO shall submit a copy of all correspondence and reports required under this Order to the Director, Air and Waste Management Division, EPA, Region I, JFK Federal Building, Boston, MA 02203.

NEPCO may assert a business confidentiality claim covering part or all of the information requested by this Order, in the manner described by 40 CFR 2.203(b). Information covered by such a claim will be disclosed by EPA only as set forth in 40 CFR Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, it may be made available to the public by EPA without further notice to NEPCO. Certain categories of information are not properly the subject of such a claim. For example, the Act provides that emission data shall in all cases be made available to the public. See 42 U.S.C. 7414(c).

D. NEPCO is hereby notified that its failure to achieve final compliance at its Salem Harbor Station with 310 CMR 7.02(8), 7.05(4) and 7.06(1) by the compliance date specified in III(A)(6) of this Order may result in an assessment of a noncompliance penalty under section 120 of the Act, 42 U.S.C. 7240. This penalty may be imposed at an earlier date, as provided under section 113(d) and section 120 of the Act, in the event that this Order is terminated or violated as provided in V(E) and (F) below. In either event, NEPCO will be formally notified of its noncompliance, under section 120(b)(3) of the Act or any regulations promulgated thereunder.

E. This Order shall be terminated in accordance with section 113(d)(8) of the Act if the Administrator determines, on the record, after notice and opportunity for hearing, that the inability of NEPCO to comply with 310 CMR 7.02(8), 7.05(4), and 7.06(1) as approved by EPA, no longer exists with respect to its Salem Harbor Station. Additionally, if NEPCO demonstrates compliance with 310 CMR 7.02(8), 7.05(4), and 7.06(1) prior to the applicable compliance dates specified in III(A)(2) and (6) of this Order, then this Order shall be terminated at that earlier date.

F. Under section 113 (d)(9) of the Act, 42 USC 7413(d)(9), violation of any requirement of this Order shall result in one or more of the following actions:

1. Enforcement of such requirement under section 113(a), (b), or (c) of the Act, 42 U.S.C. 7413(a), (b), or (c);
2. Revocation of this Order, after notice and opportunity for a public hearing;
3. Notification of noncompliance and assessment of a noncompliance penalty under section 120 of the Act.

G. This order is effective upon publication in the Federal Register and after having received concurrence from the Governor of the Commonwealth of Massachusetts.

Dated: February 2, 1982.

Anne M. Gorsuch,

Administrator, Environmental Protection Agency

[47 FR 5896, Feb. 9, 1982]

§§ 55.473—55.489 [Reserved]

Subpart X—Michigan

§§ 55.490—55.509 [Reserved]

Subpart Y—Minnesota

§§ 55.510—55.529 [Reserved]

Subpart Z—Mississippi

§§ 55.530—55.549 [Reserved]

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Subpart AA—Missouri

§ 55.550 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to Kansas City Power & Light Company, Hawthorne Station, Unit 3, 8700 Hawthorne Road, Kansas City, Missouri, upon the following conditions:

(1) *Regional limitation.* The source shall comply with MAPC Regulations III and V by January 1, 1977.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section, shall be in accordance with EPA Test Methods 5 and 9.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39319, Sept. 15, 1976]

§ 55.551 Compliance date extension.

(a) The Administrator issues a Compliance Date Extension to City Utilities of Springfield, James River Station, Units 3 and 4, South Fremont Road, Springfield, Missouri (the source), upon the following conditions:

(1) The source shall comply with MAPC Regulation III for the Springfield-Greene County Area by September 30, 1976, for Unit 4, and December 31, 1977, for Unit 3.

(2) Test procedures to determine compliance with paragraph (a)(1) of this section, shall be in accordance with ASME PTC 27.

(3) The source shall not, until January 1, 1979, be prohibited from burning coal which is available to such source by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 39319, Sept. 15, 1976]

§§ 55.552—55.569 [Reserved]

Subpart BB—Montana

§§ 55.570—55.589 [Reserved]

Subpart CC—Nebraska

§§ 55.590—55.609 [Reserved]

Subpart DD—Nevada

§§ 55.610—55.629 [Reserved]

Subpart EE—New Hampshire

§§ 55.630—55.649 [Reserved]

Subpart FF—New Jersey

§ 55.650 Delayed compliance order.

Source	Location	Order Number	Date of FEDERAL REGISTER proposal	SIP regulation involved	Final compliance date
Atlantic City Electric Co	Pennsville, N. J.	00109	Nov. 6, 1980	NN.J.A.C. 7:27-3.1, *et seq.*; *7:27-4.1, et seq.*	Oct. 1, 1983

[46 FR 7962, Jan. 26, 1981]

§§ 55.651—55.669 [Reserved]

Subpart GG—New Mexico

§§ 55.670—55.689 [Reserved]

Subpart HH—New York

§§ 55.690—55.709 [Reserved]

Subpart II—North Carolina

§ 55.710 Compliance date extensions.

(a) The Administrator issues a compliance date extension to the Carolina Power and Light Company for the L.V. Sutton Plant, Unit 3, in Wilmington, North Carolina, under the following conditions:

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(1) *Regional Limitation.* Unit 3 shall comply with 15 NCAC 2D .0503 as found in North Carolina Administrative Code, Title 15 Department of Natural and Economic Resources, Chapter 2 Environmental Management, Subchapter 2D Air Pollution Control Requirements, in accordance with the following schedule:

(i) February 1, 1977—Complete modifications to the electrostatic precipitator in accordance with North Carolina Permit No. 1318R; and complete shakedown operations and performance testing on modified electrostatic precipitator; achieve compliance with 15 NCAC 2D .0503 and certify compliance to the Director of the Enforcement Division, EPA, Region IV.

(2) The Carolina Power and Light Company shall operate and maintain the existing electrostatic precipitator on Unit 3 in proper working order and in accordance with good operating practices during the interim period specified in this paragraph for achieving compliance with 15 NCAC 2D .0503.

(3) In accordance with § 55.04(a)(2)(i)(F), the Carolina Power and Light Company shall notify the Director of the Enforcement Division, EPA, Region IV, no later than ten days after the date upon which each incremental step towards compliance is due to be completed, as to its progress in meeting the increment in question. If the increment has not been met, an explanation of this failure must be given.

(4) Unit 3 shall not, until January 1, 1979, be prohibited from burning coal which is available to it by reason of the application of any air pollution requirement except as provided in section 119(d)(3) of the Clean Air Act (42 U.S.C. 1857, et seq.).

[41 FR 55195, Dec. 17, 1976]

§§ 55.711—55.729 [Reserved]

Subpart JJ—North Dakota

§§ 55.730—55.749 [Reserved]

Subpart KK—Ohio

§§ 55.750—55.769 [Reserved]

Subpart LL—Oklahoma

§§ 55.770—55.789 [Reserved]

Subpart MM—Oregon

§§ 55.790—55.809 [Reserved]

Subpart NN—Pennsylvania

§§ 55.810—55.829 [Reserved]

Subpart OO—Rhode Island

§§ 55.830—55.849 [Reserved]

Subpart PP—South Carolina

§§ 55.850—55.869 [Reserved]

Subpart QQ—South Dakota

§§ 55.870—55.889 [Reserved]

Subpart RR—Tennessee

§§ 55.890—55.909 [Reserved]

Subpart SS—Texas

§§ 55.910—55.929 [Reserved]

Subpart TT—Utah

§§ 55.930—55.949 [Reserved]

Subpart UU—Vermont

§§ 55.950—55.969 [Reserved]

Subpart VV—Virginia

§ 55.970 Delayed compliance order.

The Administrator hereby issues a delayed compliance order to the Chesapeake Corp. of Virginia, West Point Plant, Boiler No. 8, West Point, Va. (the source), upon the following conditions:

(a) *Primary standard conditions.* The source shall not burn coal which results in the emissions of particulate matter in excess of 3.9 pounds of particulate per million Btu high heating value fuel input in accordance with the following schedule of compliance:

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(1) During the period of the order's effectiveness, the Chesapeake Corp. shall operate and maintain the existing particulate collector to insure a minimum removal efficiency of 60 percent at total capacity, and shall not burn coal with an ash content exceeding 12 percent and a heating value of less than 12,500 Btu's per pound.

(2) Within 30 days of receipt of this order, the Chesapeake Corp. shall submit a proposal for a complete air quality monitoring network to be set up by the source as required by paragraph (VI)(A)(1).

(3) Within 90 days after receiving EPA approval of the proposed network, the Chesapeake Corp. shall complete installation and begin operation of the air quality monitoring network.

(4) Within 90 days of receipt of this order, the Chesapeake Corp. shall submit for EPA approval the methods, procedures and devices the company intends to use to obtain the information required by subparagraph (VI)(B).

(b) *Plan for compliance with section IV, rules 2 and 3.* The source shall comply with section IV, rule 2 (effective date: March 17, 1972) and rule 3 (effective date: March 17, 1972; amended August 11, 1972) of the Commonwealth of Virginia in accordance with the following increments of compliance:

(1) Completed—Enter into contracts for particulate emissions controls and other equipment necessary for final compliance.

(2) Completed—Submit for approval to the Director of the EPA Region III Air and Hazardous Materials Division (hereinafter referred to as the Director), contracts for continuous particulate emission reduction systems and other equipment necessary for final compliance.

(3) March 31, 1979—Initiate onsite construction or installation of continuous particulate control systems.

(4) February 28, 1980—Complete onsite construction or installation of continuous particulate control systems.

(5) June 30, 1980—Perform emission tests in accordance with 40 CFR, Part 60 and submit reports demonstrating final compliance with the regulations of the Commonwealth of Virginia, section IV, rules 2 and 3.

(c) *Interim requirements.* The source shall comply with the following interim requirements prior to achieving compliance with section IV, rules 2 and 3 of the Commonwealth of Virginia.

(1) Not later than December 31, 1978—Enter into contracts for long-term supplies of coal.

(2) Not later than January 10, 1979—(or 10 days after signing long-term coal contracts, whichever is earlier). Submit for approval to the Director such long-term coal contracts and all information concerning the kinds of coal which the Chesapeake Corp. found available and an explanation of the reasons behind any decision to reject a contract for available coal with characteristics better than the selected coal.

(3) Within 60 days of commencing the use of coal in boiler No. 8, the Chesapeake Corp. shall perform source testing for particulate emissions using EPA method 5 as specified in Appendix A of Part 60, Title 40 of the Code of Federal Regulations, as amended. The Chesapeake Corp. shall perform such tests in a manner prescribed by EPA region III and shall provide the Regional Energy Coordinator a minimum of 15 days written notice prior to conducting such tests. The Chesapeake Corp. shall provide a complete report containing all information pertinent to the performance and results of the stack tests within 30 days of completing such tests.

(4) Within 60 days of installation of the continuous opacity monitor required, the Chesapeake Corp. shall conduct a performance specification test (PST) in accordance with performance specification 1, Appendix B of Part 60, Title 40 of the Code of Federal Regulations. The Chesapeake Corp. shall notify the Regional Energy Coordinator of the date on which the PST will be conducted at least 30 days prior to such date.

(5) Within 45 days of the PST, the Chesapeake Corp. shall submit a complete report containing all information pertinent to the PST to the Regional Energy Coordinator.

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(6) The Chesapeake Corp. shall keep monthly records of air quality data and air pollution emissions and shall be submitted within 15 days of the end of each calendar month. These records shall detail daily emissions for all fuel-burning units and shall include:

(i) Fuel consumption for each day of the preceding month.

(ii) Analysis of the fuel consumed during each week to include sulfur content, ash content and high heating value.

(iii) For the stack serving boiler No. 8, a record of the hourly measurement of opacity acquired by means of a continuous opacity monitoring device.

(7) The Chesapeake Corp. shall notify the Director of any exceedances of the national primary ambient air quality standards within 72 hours of the collection of such data.

(8) The Chesapeake Corp. shall notify the Director within 10 days after each incremental requirement has been satisfied, or within 10 days after the final date set for achieving each such requirement, if such requirement has not been achieved.

(d) Violation of any requirement of this order shall result in one or more of the following actions:

(1) Enforcement of such requirement pursuant to subsection 113 (a), (b), or (c) of the Act, including possible judicial action for an injunction and/or penalties and in appropriate cases, criminal prosecution.

(2) Revocation of this order, after notice and opportunity for a public hearing, and subsequent enforcement of the Virginia State implementation plan.

(3) If such violation occurs on or after July 1, 1979, notice of noncompliance and subsequent action pursuant to section 120 of the Act.

(e) Nothing herein shall affect the responsibility of the Chesapeake Corp. to comply with State, local, or other Federal regulations.

The entire order is hereby referenced. Any terms or conditions appearing in the order and not contained herein does not excuse compliance by Chesapeake Corp.

(42 U.S.C. 7413(d))

[43 FR 35922, Aug. 14, 1978]

§ 55.971 Delayed compliance order.

The Administrator hereby issues a delayed compliance order to Avtex Fibers Inc., Front Royal Plant, Boiler Numbers one (1), two (2), and three (3), Front Royal, Virginia ("the source"), upon the following conditions:

(a) *Primary standard conditions.* The source shall not burn coal which results in the emissions of particulate matter in excess of 262 pounds of particulate matter per hour from either Boiler Numbers one (1), two (2), or three (3) and 330 pounds of particulate matter per hour from either Boiler Numbers four (4) or five (5) in accordance with the following schedule of compliance:

(1) During the period of the order's effectiveness, Avtex Fibers shall operate and maintain the particulate collection equipment on Boiler Numbers one (1), two (2), and three (3) to ensure a minimum removal efficiency of 86 percent at total capacity, and on Boiler Numbers four (4) and five (5) a minimum removal efficiency of 82 percent at total capacity.

(2) During the period of the order's effectiveness, Avtex Fibers shall not burn coal with an ash content exceeding 10 percent and a heating value of less that 12,500 BTU's per pound.

(3) Within 30 days of the effectiveness of this order, Avtex Fibers shall submit a proposal for a complete air quality monitoring network to be set up by the source as required by paragraph (VI)(A)(1).

(4) Within 90 days after receiving EPA approval of the proposed network, Avtex Fibers shall complete installation and begin operation of the air quality monitoring network.

(5) Within 90 days of the effectiveness of this order, Avtex Fibers shall submit for EPA approval the methods, procedures, and devices the Company intends to use to obtain the information required by paragraph (VI)(B).

(b) *Plan for compliance with Section IV, Rules 2 and 3.* The source shall comply with Section IV, Rule 2 (effective date: March 17, 1972) and Rule 3 (effective date: March 17, 1972; amended August 11, 1972) of the Commonwealth of Virginia in accordance

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with the following increments of compliance:

(1) Completed—Complete on-site construction of high efficiency multicyclone collector on Boiler Number three (3).

(2) August 15, 1978—Complete on-site construction of high efficiency multicyclone collector on Boiler Number one (1).

(3) September 30, 1978—Complete on-site construction of high efficiency multicyclone collector on Boiler Number two (2).

(4) Completed—Enter into contracts for particulate emissions controls and other equipment necessary for final compliance.

(5) June 30, 1978—Submit for approval to the Director of the EPA, Region III, Air and Hazardous Materials Division (hereinafter referred to as "the Director"), contracts for continuous particulate emissions reduction systems and other equipment necessary for final compliance.

(6) April 30, 1979—Initiate on-site construction or installation of continuous particulate control systems.

(7) April 30, 1980—Complete on-site construction or installation of continuous particulate control systems.

(8) June 30, 1980—Perform emissions tests in accordance with 40 CFR, Part 60 and submit reports demonstrating final compliance with the Regulations of the Commonwealth of Virginia, Section IV, Rules 2 and 3.

(c) *Interim requirements.* The source shall comply with the following interim requirements prior to achieving compliance with Section IV, Rules 2 and 3 of the Commonwealth of Virginia.

(1) Within 60 days of commencing the use of coal in Boiler Number two (2), Avtex Fibers shall perform source testing for particulate emissions using EPA Method Five (5) as specified in Appendix A of Part 60, Title 40 of the Code of Federal Regulations, as amended. The Company shall perform such tests in a manner prescribed by EPA Region III and shall provide the Regional Energy Coordinator a minimum of 15 days written notice prior to conducting such tests. The Avtex Fibers Inc. shall provide a complete report containing all information pertinent to the performance and results of the stack tests within 30 days of completing such tests.

(2) Within 120 days of the effectiveness of this order, Avtex Fibers shall conduct and record visible emissions observations on the exhaust gas emissions from Boiler Numbers one (1), two (2), and three (3). Such observations shall be conducted by certified observers in accordance with EPA Method Nine (9) as specified in Appendix A of Part 60, Title 40 of the Code of Federal Regulations, as amended. Such observations shall be for a period of at least one continuous hour per stack per day.

(3) The Avtex Fibers shall keep monthly records of air quality and air pollution emissions data and shall be submitted within 15 days of the end of each calendar month. These records shall detail daily emissions for all fuel-burning units and shall include:

(i) Fuel consumption for each day of the preceding month.

(ii) Analysis of the fuel consumed during each week to include sulfur content, ash content and high heating value.

(iii) For the stacks serving Boiler Numbers one (1), two (2), and three (3), a record of the hourly visible emissions observations on the exhaust gas emissions by means of certified observers.

(4) The Avtex Fibers Inc. shall notify the Director of any instances of exceeding the National Primary Ambient Air Quality Standards within 72 hours of the collection of such data.

(5) The Avtex Fibers Inc. shall notify the Director within 10 days after each incremental requirement has been satisfied, or within 10 days after the final date set for achieving each such requirement, if such requirement has not been achieved.

(d) Violation of any requirement of this order shall result in one or more of the following actions:

(1) Enforcement of such requirement pursuant to subsection 113 (a), (b), or (c) of the Clean Air Act, including possible judicial action for injunction and/or penalties and in appropriate cases, criminal prosecution.

(2) Revocation of this order, after notice and opportunity for a public

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hearing, and subsequent enforcement of the Virginia State Implementation Plan.

(3) If such violation occurs on or after July 1, 1979, notice of noncompliance and subsequent action pursuant to Section 120 of the Act.

(e) Nothing herein shall affect the responsibility of Avtex Fibers Inc. to comply with State, local, or other Federal laws or regulations.

The entire order is hereby referenced. Any terms or conditions appearing in the order and not contained herein does not excuse compliance by Avtex Fibers Inc.

(42 U.S.C. 7413(d))

[43 FR 59840, Dec. 22, 1978]

§ 55.972 Delayed Compliance Order.

The Administrator hereby issues a delayed compliance order to the Virginia Electric and Power Company's Portsmouth Generating Station, Boiler Number 4, Portsmouth, Virginia (the source), upon the following conditions:

(a) *Primary standard conditions.* The source shall not burn coal which results in the emissions of particulate matter in excess of 2263 pounds of particulate matter per hour from Boiler Number 4 at maximum load and 492 pounds of particulate matter per hour at maximum load from Boiler Numbers 1, 2 and 3 combined, in accordance with the following schedule of compliance:

(1) During the period of the ORDER's effectiveness, the source shall not burn coal with an ash content exceeding 12 percent (12%) and a high heating value of less than 12,000 British Thermal Units (BTU's) per pound.

(2) Within 30 days of receipt of this ORDER, the Virginia Electic and Power Company (the Company) shall submit a proposal for a complete air quality monitoring network to be set up by the Company in the vicinity of the source as required by subparagraph (VI)(A)(1).

(3) Within 90 days after receiving EPA approval of the proposed network, the Company shall complete installation and begin operation of the air quality monitoring network.

(4) Within 90 days of receipt of this ORDER, the Company shall submit for EPA approval the methods, procedures and devices the Company intends to use to obtain the information required by subparagraph (VI)(B).

(b) *Plan for compliance with Section IV, Rules 2 and 3.* The source shall comply with Section IV, Rule 2 (effective date: March 17, 1972) and Rule 3 (effective date: March 17, 1972; amended August 11, 1972) of the Commonwealth of Virginia in accordance with the following increments of compliance.

(1) April 1, 1980—Enter into contracts for particulate emissions controls and other equipment necessary for final compliance.

(2) May 1, 1980—Submit for approval to the Director of the EPA Region III Air, Toxics and Hazardous Materials Division (hereinafter referred to as the Director), contracts for continuous particulate emission reduction systems and other equipment necessary for final compliance.

(3) April 1, 1981—Initiate on-site construction or installation of continuous particulate control systems.

(4) April 1, 1982—Complete on-site construction or installation of continuous particulate control systems.

(5) June 30, 1982—Perform emission tests in accordance with 40 CFR Part 60 and submit reports demonstrating final compliance with the Regulations of the Commonwealth of Virginia, Section IV, Rules 2 and 3.

(c) *Interim requirements.* The source shall comply with the following interim requirements prior to achieving compliance with Section IV, Rules 2 and 3 of the Commonwealth of Virginia.

(1) Within 60 days of commencing the use of coal in Boiler Number 4, the Company shall perform source testing for particulate emissions using EPA Method 5 as specified in Appendix A of Part 60, Title 40 of the Code of Federal Regulations, as amended. The Company shall perform such tests in a manner prescribed by EPA Region III and shall provide the Regional Energy Coordinator a minimum of 15 days written notice prior to conducting such tests. The Company shall provide

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a complete report containing all information pertinent to the performance and results of the stack tests within 30 days of completing such tests.

(2) Within 60 days of installation of the continuous opacity monitor required under subparagraph (VI)(A)(6), the Company shall conduct a Performance Specification Test (PST) in accordance with Performance Specification 1, Appendix B of Part 60, Title 40 of the Code of Federal Regulations. The Company shall notify the Regional Energy Coordinator of the date on which the PST will be conducted at least 30 days prior to such date.

(3) Within 45 days of the PST, the Company shall submit a complete report containing all information pertinent to the PST to the Regional Energy Coordinator.

(4) The Company shall keep monthly records of both air quality monitoring data and air pollutant emissions and shall submit such records within 15 days of the end of each calendar month to the Regional Energy Coordinator. These records shall detail daily emissions for all fuel-burning units and shall include for each unit:

(i) Fuel consumption for each day of the preceding month.

(ii) Analysis of the fuel consumed during each week to include sulfur content, ash content and high heating value.

(iii) For the stack serving boiler number 4, a record of the hourly measurement of opacity acquired by means of a continuous opacity monitoring device.

(5) The Company shall notify the Director of any exceedance of the National Primary Ambient Air Quality Standards within 72 hours of the collection of such data.

(6) The Company shall notify the Director within 10 days after each incremental requirement has been satisfied, or within 10 days after the final date set for achieving each such requirement, if such requirement has not been achieved.

(d) Violation of any requirement of this ORDER shall result in one or more of the following actions:

(1) Enforcement of such requirement pursuant to subsection 113(a), (b), or (c) of the Act, including possible judicial action for an injunction and/or penalties and in appropriate cases, criminal prosecution.

(2) Revocation of this ORDER, after notice and opportunity for a public hearing, and subsequent enforcement of the Virginia State Implementation Plan.

(3) If such violation occurs, notice of noncompliance and subsequent action pursuant to Section 120 of the Act.

(e) Nothing herein shall affect the responsibility of the Company to comply with State, local, or other Federal regulations.

The entire ORDER is hereby referenced. Any terms or conditions appearing in the ORDER and not contained herein does not excuse noncompliance by Virginia Electric and Power Company.

[45 FR 41415, June 19, 1980]

§§ 55.973—55.989 [Reserved]

Subpart WW—Washington

§§ 55.990—55.1009 [Reserved]

Subpart XX—West Virginia

§§ 55.1010—55.1029 [Reserved]

Subpart YY—Wisconsin

§§ 55.1030—55.1049 [Reserved]

Subpart ZZ—Wyoming

§§ 55.1050—55.1069 [Reserved]

PART 56—REGIONAL CONSISTENCY

Sec.

56.1 Definitions.
56.2 Scope.
56.3 Policy.
56.4 Mechanisms for fairness and uniformity—Responsibilities of Headquarters employees.
56.5 Mechanisms for fairness and uniformity—Responsibilities of Regional Office employees.
56.6 Dissemination of policy and guidance.
56.7 State agency performance audits.

AUTHORITY: Sec. 301(a)(2) of the Clean Air Act as amended (42 USC 7601).

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SOURCE: 45 FR 85405, Dec. 24, 1980, unless otherwise noted.

§ 56.1 Definitions.

As used in this part, all terms not defined herein have the meaning given them in the Clean Air Act.

"Act" means the Clean Air Act as amended (42 USC 7401 et seq.).

"Administrator," "Deputy Administrator," "Assistant Administrator," "General Counsel," Associate General Counsel," "Deputy Assistant Administrator," "Regional Administrator," "Headquarters," "Staff Office," "Operational Office," and "Regional Office" are described in Part 1 of this Title.

"Mechanism" means an administrative procedure, guideline, manual, or written statement.

"Program directive" means any formal written statement by the Administrator, the Deputy Administrator, the Assistant Administrator, a Staff Office Director, the General Counsel, a Deputy Assistant Administrator, an Associate General Counsel, or a division Director of an Operational Office that is intended to guide or direct Regional Offices in the implementation or enforcement of the provisions of the Act.

"Responsible official" means the EPA Administrator or any EPA employee who is accountable to the Administrator for carrying out a power or duty delegated under Section 301(a)(1) of the Act, or is accountable in accordance with EPA's formal organization for a particular program or function as described in Part 1 of this Title.

§ 56.2 Scope.

This part covers actions taken by:

(a) Employees in EPA Regional Offices, including Regional Administrators, in carrying out powers and duties delegated by the Administrator under section 301(a)(1) of the Act; and

(b) EPA employees in Headquarters to the extent that they are responsible for developing the procedures to be employed or policies to be followed by Regional Offices in implementing and enforcing the Act.

§ 56.3 Policy.

It is EPA's policy to:

(a) Assure fair and uniform application by all Regional Offices of the criteria, procedures, and policies employed in implementing and enforcing the Act;

(b) Provide mechanisms for identifying and correcting inconsistencies by standardizing criteria, procedures, and policies being employed by Regional Office employees in implementing and enforcing the Act; and

(c) Insure an adequate quality audit for each State's performance in implementing and enforcing the Act.

§ 56.4 Mechanisms for fairness and uniformity—Responsibilities of Headquarters employees.

(a) The Administrator shall include, as necessary, with any rule or regulation proposed or promulgated under Parts 51 and 58 of this chapter [1] mechanisms to assure that the rule or regulation is implemented and enforced fairly and uniformly by the Regional Offices.

(b) The determination that a mechanism required under paragraph (a) of this section is unnecessary for a rule or regulation shall be explained in writing by the responsible EPA official and included in the supporting documentation or the relevant docket.

§ 56.5 Mechanisms for fairness and uniformity—Responsibilities of Regional Office employees.

(a) Each responsible official in a Regional Office, including the Regional Administrator, shall assure that actions taken under the Act:

(1) Are carried out fairly and in a manner that is consistent with the Act and Agency policy as set forth in the Agency rules and program directives,

(2) Are as consistent as reasonably possible with the activities of other Regional Offices, and

(3) Comply with the mechanisms developed under § 56.4 of this part.

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[1] Part 51 is entitled, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans." Part 58 is entitled, "Ambient Air Quality Surveillance."

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(b) A responsible official in a Regional Office shall seek concurrence from the appropriate EPA Headquarters office on any interpretation of the Act, or rule, regulation, or program directive when such interpretation may result in inconsistent application among the Regional Offices of the Act or rule, regulation, or program directive.

(c) In reviewing State Implementation Plans, the Regional Office shall follow the provisions of the guideline, revisions to State Implementation Plans—Procedures for Approval/Disapproval Actions, OAQPS No. 1.2-005A, or revision thereof. Where regulatory actions may involve inconsistent application of the requirements of the Act, the Regional Offices shall classify such actions as special actions.

§ 56.6 Dissemination of policy and guidance.

The Assistant Administrators of the Offices of Air, Noise and Radiation, and of Enforcement, and the General Counsel shall establish as expeditiously as practicable, but no later than one year after promulgation of this part, systems to disseminate policy and guidance. They shall distribute material under foregoing systems to the Regional Offices and State and local agencies, and shall make the material available to the public. Air programs policy and guideline systems shall contain the following:

(a) Compilations of relevant EPA program directives and guidance, except for rules and regulations, concerning the requirements under the Act.

(b) Procedures whereby each Headquarters program office and staff office will enter new and revised guidance into the compilations and cause superseded guidance to be removed.

(c) Additional guidance aids such as videotape presentations, workshops, manuals, or combinations of these where the responsible Headquarters official determines they are necessary to inform Regional Offices, State and local agencies, or the public about EPA actions.

§ 56.7 State agency performance audits.

(a) EPA will utilize the provisions of Subpart B, Program Grants, of Part 35 of this chapter, which require yearly evaluations of the manner in which grantees use Federal monies, to assure that an adequate evaluation of each State's performance in implementing and enforcing the Act is performed.

(b) Within 60 days after comment is due from each State grantee on the evaluation report required by § 35.538 of this chapter, the Regional Administrator shall incorporate or include any comments, as appropriate, and publish notice of availability of the evaluation report in the FEDERAL REGISTER.

PART 57—PRIMARY NONFERROUS SMELTER ORDERS

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APPENDIX A—PRIMARY NONFERROUS SMELTER ORDER (NSO) APPLICATION

AUTHORITY: Secs. 110, 114, 119, 301, Clean Air Act, as amended (42 U.S.C. 7410, 7414, 7419, and 7601); sec. 406 of Pub. L. 95-95.

SOURCE: 45 FR 42536, June 24, 1980, unless otherwise noted.

Subpart A—General

§ 57.101 Purpose and scope.

(a) *Applicability of the regulations.* The regulations in Subparts A through H govern:

(1) The eligibility of smelters for a first Primary Nonferrous Smelter Order (NSO) under section 119 of the Clean Air Act;

(2) The procedures through which a first NSO can be approved or issued by EPA; and

(3) The minimum contents of each first NSO required for EPA issuance or approval under section 119. Subparts I *et seq.*, will contain NSOs in effect for individual smelters.

(b) *State authority to adopt more stringent requirements.* Nothing in this part shall preclude a State from imposing more stringent requirements, as provided by Section 116 of the Clean Air Act.

§ 57.102 Eligibility.

(a) A primary copper, lead, or zinc smelter is eligible for an NSO if it meets the following conditions:

(1) The smelter was in existence and operating on August 7, 1977;

(2) The smelter is subject to an approved or promulgated sulfur dioxide (SO_2) State Implementation Plan (SIP) stack emission limitation which is adequate to ensure that National Ambient Air Quality Standards (NAAQS) for SO_2 are achieved without the use of any unauthorized dispersion techniques; and

(3) The Administrator determines, based on a showing by the smelter owner, that no means of emission limitation applicable to the smelter which would enable it to comply with its SIP stack emission limitation for SO_2 has been adequately demonstrated to be reasonably available (taking into account the cost of compliance, nonair quality health and environmental impact, and energy considerations).

(b) For the purposes of this section:

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(1) The following means of emission limitation shall be considered *adequately demonstrated* for copper, lead, and zinc smelters (taking into account nonair quality health and environmental impact and energy considerations, but not the cost of compliance):

(i) The sulfuric acid plant and associated process technology underlying EPA's new source performance standards for primary copper, lead, and zinc smelters (40 CFR Part 60, Subparts P, Q, and R);

(ii) Magnesium oxide concentration (scrubbing);

(iii) Lime/limestone scrubbing; and

(iv) Ammonia scrubbing.

(2) An applicable means of emission limitation which would enable a smelter to comply with its SIP emission limitation for SO_2 shall be considered *reasonably available* to the smelter (taking into account the cost of compliance) if the information submitted under §§ 57.107(a) and 57.203(b) (plus any necessary supplemental information) shows, according to the criteria, procedures, and tests contained in Appendix A to this part, that (after the installation of the system) the sum of the present value of the smelter's future net income plus its terminal value would exceed the smelter's liquidation (salvage) value.

(3) For the purposes of this section, each adequately demonstrated means of emission limitation which would enable a smelter to comply with its SIP emission limitation for SO_2 shall be considered *applicable* to the smelter unless the smelter operator demonstrates that the use of a particular system at that smelter is technically unreasonable, *for reasons specific to that site.*

§ 57.103 Definitions.

(a) *The Act* means the Clean Air Act, as amended.

(b) *Active use* refers to an SO_2 constant control system installed at a smelter before August 7, 1977 and not totally removed from regular service by that date.

(c) *Adequate SO_2 emission limitation* means an SIP stack emission limitation which was approved or promulgated by EPA as adequate to attain and maintain the NAAQS in the areas affected by the stack emissions without the use of any unauthorized dispersion technique.

(d) *Administrative Law Judge* means an administrative law judge appointed under 5 U.S.C. 3105 (see also 5 CFR Part 930, as amended by 37 FR 16787), and is synonymous with the term "Hearing Examiner" as formerly used in Title 5 of the United States Code.

(e) The *Administrator* means the Administrator of the United States Environmental Protection Agency, or the Administrator's authorized representative.

(f) *Ambient air* shall have the meaning given by 40 CFR 50.1(e), as that definition appears upon promulgation of this subpart, or as hereafter amended.

(g) *Ambient air quality* refers only to concentrations of sulfur dioxide in the ambient air, unless otherwise specified.

(h) *An approved measure* refers to one contained in an NSO which is in effect.

(i) *Assistant Administrator for Air, Noise & Radiation* means the Assistant Administrator for Air, Noise & Radiation of the United States Environmental Protection Agency.

(j) *Assistant Administrator for Enforcement* means the Assistant Administrator for Enforcement of the United States Environmental Protection Agency.

(k) *Constant controls, control technology,* and *continuous emission reduction technology* mean systems which limit the quantity, rate, or concentration of emissions of air pollutants on a continuous basis.

(l) *Effective date of an NSO* means the effective date listed in the FEDERAL REGISTER publication of EPA's issuance or approval of an NSO.

(m) *EPA* and the *Agency* means the Administrator of the United States Environmental Protection Agency, or the Administrator's authorized representative.

(n) *Fugitive emissions* means any air pollutants emitted to the atmosphere other than from a stack.

(o) *Issuance* of an NSO means the final transmittal of the NSO pursuant to § 57.107(a) by an issuing agency (other than EPA) to EPA for approval,

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or the publication of an NSO issued by EPA in the FEDERAL REGISTER.

(p) *Issuing agency*, unless otherwise specifically indicated, includes both EPA and the state or local air pollution control agency to which a smelter's owner has applied for an NSO, or which has issued the NSO. Any showings or demonstrations required to be made under this part to the issuing agency are subject to independent determinations by EPA.

(q) *Judicial Officer* means an attorney who is a permanent or temporary employee of the United States Environmental Protection Agency.

(r) *Malfunction* means any unanticipated and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor design, poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions. A malfunction exists only for the minimum time necessary to implement corrective measures.

(s) *Maximum production capacity* means either the maximum demonstrated rate at which a smelter has produced its principal metallic final product under the process equipment configuration and operating procedures prevailing on or before August 7, 1977, or a rate which the smelter is able to demonstrate by calculation is attainable with existing process equipment. The rate may be expressed as a concentrate feed rate to the smelter.

(t) *NAAQS* and *National Ambient Air Quality Standards*, unless otherwise specified, refer only to the National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide.

(u) *Scheduled maintenance* means any periodic procedure, necessary to maintain the integrity or reliability of emissions control performance, which can be anticipated and scheduled in advance. In sulfuric acid plants, it includes among other items the screening or replacement of catalyst, the retubing of heat exchangers, and the routine repair and cleaning of gas cleaning equipment.

(v) *Smelter owner* and *operator* mean the owner or operator of the smelter, without distinction.

(w) *Supplementary control system* (SCS) means any technique for limiting the concentration of a pollutant in the ambient air by varying the emissions of that pollutant according to atmospheric conditions. For the purposes of this part, the term supplementary control system does not include any dispersion technique based solely on the use of a stack the height of which exceeds good engineering practice (as determined under regulations implementing section 123 of the Act).

(x) *Unauthorized dispersion technique* refers to any dispersion technique which, under section 123 of the Act and the regulations promulgated pursuant to that section, may not be used to reduce the degree of emission limitation otherwise required in the applicable SIP.

(y) Unless otherwise specified in this part, all terms shall have the same meaning given them by the Act.

§ 57.104 Amendment of the NSO.

An NSO shall be amended whenever necessary for compliance with the requirements and purposes of this part.

(a) *Issuance of amendment.* A state or local issuing agency may issue an amendment of any NSO it has issued. Any amendment issued by a State or local issuing agency shall be subject to approval by EPA to the same extent as was the original NSO. Any smelter owner may apply to the agency which originally issued its NSO for an amendment of the NSO at any time. Such an application shall be accompanied by whatever documentation is required by that agency (or EPA) to support the requested amendment.

(b) *Revision of SCS Manual.* Operation in accordance with the revised provisions of an SCS operational manual (see § 57.402(e)) shall not be considered a violation of an NSO while the application for approval of those revisions as NSO amendments is pending before the issuing agency (or EPA) for approval: *Provided*, That:

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(1) No violations of NAAQS occur in the smelter's Designated Liability Area during that time; and

(2) The smelter operator has not been informed by the issuing agency or EPA that its application is not adequately documented, unless such deficiency has been remedied promptly.

(c) *Termination or revocation.* This section shall not apply to termination or revocation of NSOs, or to a requirement for the use of additional systems of continuous emission reduction technology under section 119(d)(4) of the Act.

§ 57.105 Submittal of required plans, proposals, and reports.

The failure of a smelter owner to submit any plan, report, document or proposal as required by its NSO or by this part shall constitute a violation of its NSO.

§ 57.106 Expiration date.

Each NSO shall state its expiration date. No first NSO shall expire later than January 1, 1983.

§ 57.107 The State or local agency's transmittal to EPA.

(a) *Content and bases of the State or local agency's NSO.* Issuance of an NSO by a State or local agency shall be completed by the issuing agency's transmittal to the appropriate EPA Regional Office of:

(1) The text of the NSO;

(2) The application submitted by the smelter owner, except for Appendix A to this part, any correspondence between the issuing agency and the applicant relating to the NSO, and any material submitted in support of the application;

(3) A concise statement of the State or local agency's findings and their bases; and

(4) Any documentation or analyses prepared by or for the issuing agency in support of the NSO.

(b) *The State or local agency's enforcement plan.* The transmittal under paragraph (a) of this section shall be accompanied by a description of the issuing agency's plans for monitoring compliance with and enforcement of the NSO. The transmittal shall also include a description of the resources which will be used to implement those plans. If the enforcement plans appear inadequate, EPA may require additional assurances that the NSOs will be adequately enforced.

§ 57.108 Comparable existing SIP provisions.

Notwithstanding any other provision of this part, an NSO may contain provisions to which the affected smelter is subject under the applicable EPA-approved state implementation plan (SIP) for sulfur dioxide in lieu of the corresponding provisions which would otherwise be required under this part if the Administrator determines that those SIP provisions are substantially equivalent to the corresponding NSO provisions which would otherwise be required, and if the Administrator determines that the smelter is in substantial compliance with those SIP provisions. For the purposes of this section, provisions to which the affected smelter is subject under the applicable EPA-approved State Implementation Plan are those which became effective before the smelter owner applied for the NSO.

§ 57.109 Maintenance of pay.

The Administrator will not approve or issue an NSO for any smelter unless he has approved or promulgated SIP provisions which are applicable to the smelter and which satisfy the requirements of section 110(a)(6) of the Clean Air Act.

§ 57.110 Reimbursement to State or local agency.

As a condition of issuing an NSO, any issuing agency may require the smelter operator to pay a fee to the State or local agency sufficient to defray the issuing agency's expenses in issuing and enforcing the NSO.

§ 57.111 Severability of provisions.

The provisions promulgated in this part and the various applications thereof are distinct and severable. If any provision of this part or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions, or the application of such provisions

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to other persons or circumstances, which can be given effect without the invalid provision of application.

Subpart B—The Application

§ 57.201 Where to apply.

Any eligible smelter may apply for an NSO to the appropriate EPA Regional Office or to the appropriate State or local air pollution control agency.

(a) When application is made to EPA, all parts of the application required to be submitted under this subpart shall be sent directly to the Director, Division of Stationary Source Enforcement (EN-341), U.S. Environmental Protection Agency, 401 M St. S.W., Washington, D.C. 20460, Attention: Confidential Information Unit. In addition, the smelter owner shall send a copy of the application, except that part required to be submitted under § 57.203(b) (eligibility), directly to the appropriate EPA Regional Office.

(b) When application is made to the appropriate State or local agency, the smelter owner shall submit one complete copy of all parts of the application required to be submitted under this subpart to that agency, in *addition* to the application requirements contained in paragraph (a) of this section. If the smelter owner is requesting an advance eligibility determination pursuant to § 57.203(b), such request must be made in writing and shall accompany the copy of the application being sent to the Director of the Division of Stationary Source Enforcement of the Environmental Protection Agency.

(c) If the smelter owner is requesting a waiver of the interim constant control requirement of § 57.301, such request must be sent directly to the Director, Division of Stationary Source Enforcement, at the time of application, in accordance with § 57.802.

§ 57.202 How to apply.

(a) *Letter of intent.* To initiate an application for an NSO, the owner or operator of a smelter shall send a letter of intent to an appropriate air pollution control agency. The letter of intent shall contain a statement of the owner's intent to apply for an NSO, and an agreement to provide any information required under this part. The letter of intent shall be signed by a corporate official authorized to make such commitments. Upon receipt of any letter of intent by the issuing agency, the SIP emission limitation for sulfur dioxide, as to that applicant, shall be deemed suspended for 90 days. The 90 day period may be extended for good cause at the discretion of the Administrator.

(b) *Complete application.* (1) Within the period referred to in paragraph (a) of this section, the smelter owner shall submit its completed application pursuant to § 57.201. Receipt of all parts of a substantially complete application postmarked within the original or extended application period shall be deemed to continue the suspension of the SIP emission limitation for SO_2 until the issuing agency issues or declines to issue an NSO. This suspension shall in all cases terminate, however, 90 days after receipt of the substantially completed application, unless extended for good cause at the discretion of the Administrator. If, in the Administrator's judgment, a good faith effort has been made to submit a complete application, additional time may be granted to allow for correction of minor deficiencies.

(2) If an issuing agency transmits an NSO to EPA for approval before the expiration of the suspension of the federal SIP emission limitation, the suspension shall continue until EPA approves or disapproves the NSO. Such action shall be taken by EPA within 90 days of receipt of a transmittal under § 57.107.

§ 57.203 Contents of the application.

(a) *Claim of confidentiality.* The smelter owner may make a business confidentiality claim covering all or part of the information in the NSO application in accordance with 40 CFR Part 2, Subpart B (41 FR 36906 *et seq.*, September 1, 1976, as amended by 43 FR 39997 *et. seq.*, September 8, 1978). A claim is effective only if it is made at the time the material is submitted to the issuing agency or EPA. A claim shall be made by attaching to the information a notice of confidentiality.

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Information claimed as confidential will be handled by EPA under the provisions of 40 CFR Part 2, Subpart B. If no claim accompanies the information, it may be made available to the public without further notice.

(b) *Eligibility information.* Each smelter owner shall make the showing required by § 57.102(a)(3) by completing and submitting Appendix A to this part and any necessary supplemental information to the issuing agency as a part of its application. Any smelter owner or State may, at its option, simultaneously submit this material to EPA for an advance eligibility determination.

(c) *Current operating information.* A complete NSO application shall also contain the following information:

(1) A process flow diagram of the smelter, including current process and instrumentation diagrams for all processes or equipment which may emit or affect the emission of sulfur dioxide; the characteristics of all gas streams emitted from the smelter's process equipment (flow rates, temperature, volumes, compositions, and variations over time); and a list of all monitoring data and strip charts, including all data, charts, logs or sheets kept with respect to the operation of any process equipment which may emit or affect the emission of sulfur dioxide;

(2) The smelter's maximum daily production capacity (as defined in § 57.103(s)), as of August 7, 1977; the operational rate (in pounds of charge per hour) of each major piece of process equipment when the smelter is operating at that capacity; and the smelter's average and maximum daily production rate for each product, coproduct, or by-product, by year, for the past 2 years;

(3) The optimal conversion efficiency of any acid plant or other sulfur dioxide control system under the normal process operating conditions (excluding malfunctions) most conducive to optimal conversion efficiency;

(4) The average conversion efficiency of any acid plant or other sulfur dioxide control system during normal process operations (excluding malfunctions), by month, during the past 2 years;

(5) The percent of the time the acid plant or other control system was available for service during each month for the past 2 years, excluding down-time for scheduled maintenance, and a full explanation of any major or recurring problems with the system during that time;

(6) The frequency and duration of times during the past 2 years when the SO_2 control system was unavailable because of scheduled maintenance of the system;

(7) A description of all scheduled, periodic shut downs of the smelter during the past 2 years, including their purpose, frequency and duration; and the same information with respect to unscheduled shutdowns;

(8) The gas volume, rates, and SO_2 concentration which the control system was actually designed to accommodate, taking into account any modifications made after its installation;

(9) The average monthly sulfur balance across the process and control equipment, including fugitive emissions, for the past 2 years; and

(10) A description of engineering techniques now in use at the smelter to prevent the release of fugitive emissions into the atmosphere at low elevations.

(d) *The smelter owner's proposals.* The smelter owner shall submit as part of its application draft NSO provisions which would implement the requirements of Subparts C through G of this part. The issuing agency may use these proposals as the basis for any NSO that may be granted, or may modify these proposals in any way it deems necessary in order to comply with the requirements of this part.

(e) *Additional information.* The smelter owner shall designate in its application a corporate officer responsible and authorized to supply supplemental technical and economic information and explanations as required by the issuing agency during the formulation of the NSO. Failure to supply such information and explanations shall constitute a failure to submit a complete application.

(f) *Request for a waiver of constant controls.* Any request for a waiver of the interim constant control require-

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ment of § 57.301 shall be made in accordance with § 57.802. The criteria and procedures for granting the waiver are governed by Subpart H of this part.

Subpart C—Constant Controls and Related Requirements

§ 57.301 General requirements.

Each NSO shall require an interim level of sulfur dioxide constant controls to be operated at the smelter, unless a waiver of this requirement has been granted to the owner under Subpart H of this part. Except as otherwise provided in § 57.304, the interim constant controls shall be properly operated and maintained at all times. The NSO shall require the following gas streams to be treated by interim constant controls:

(a) In copper smelters, off-gases from fluidized bed roasters, flash furnances, NORANDA reactors, electric furnaces and copper converters;

(b) In lead smelters, off-gases from the front end of the sintering machine and any other sinter gases which are re-circulated;

(c) In zinc smelters, off-gases from multi-hearth roasters, flash roasters and fluidized bed roasters; and

(d) In all smelters, any other process streams which were regularly or intermittently treated by constant controls at the smelter as of August 7, 1977.

§ 57.302 Performance level of Interim Constant Controls.

(a) *Maximum feasible efficiency.* Each NSO shall require: That the smelter operate its interim constant control systems at their maximum feasible efficiency, including the making of any improvements necessary to correct the effects of any serious deficiencies; that the process and control equipment be maintained in the way best designed to ensure such operation; and that process operations be scheduled and coordinated to facilitate treatment of process gas streams to the maximum possible extent. Maximum feasible efficiency shall be expressed in the NSO in the form of a limitation on the concentration of SO_2 in the tail gas of each individual control system in combination with an appropriate averaging period, as provided below in paragraphs (b) and (c) of this section.

(b) *The limitation level for SO_2 concentration in the control system tail gas.* The level at which the concentration limitation is set shall take into account fluctuations in the strength and volume of process off-gases to the extent that those fluctuations affect the SO_2 content of the tail gas and cannot be avoided by improved scheduling and coordination of process operations. The limitation shall exclude the effect of any increase in emissions caused by process or control equipment malfunction. The limitation shall take into account unavoidable catalyst deterioration in sulfuric acid plants, but may prescribe the frequency of catalyst screening or replacement. The NSO shall also prohibit the smelter owner from using dilution air to meet the limitation.

(c) *Averaging period.* (1) The averaging period shall be derived in combination with the concentration limitation and shall take into account the same factors described in paragraph (b). The averaging periods established under this paragraph should generally not exceed the following:

(i) For sulfuric acid plants on copper smelters, 12 hour running average;

(ii) For sulfuric acid plants on lead smelters, 6 hour running average;

(iii) For sulfuric acid plants on zinc smelters, 2 hour running average;

(iv) For dimethylaniline (DMA) scrubbing units on copper smelters, 2 hour running average.

(2) A different averaging period may be established if the applicant demonstrates that such a period is necessary in order to account for the factors described in paragraph (b) of this section: *Provided,* That the period is enforceable and satisfies the criteria of paragraph (a) of this section.

(d) *Improved performance.* (1) The performance level representing maximum feasible efficiency for any existing control system (*e.g.,* a sulfuric acid plant or a DMA scrubber) shall require the correction of the effects of any serious deficiencies in the system. For the purpose of this paragraph, at least the following problems shall con-

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stitute serious deficiencies in acid plants:

(i) Heat exchangers and associated equipment inadequate to sustain efficient, autothermal operation at the average gas strengths and volumes received by the acid plant during routine process equipment operation;

(ii) Failure to completely fill all available catalyst bed stages with sufficient catalyst;

(iii) Inability of the gas pre-treatment system to prevent unduly frequent plugging or fouling (deterioration) of catalyst or other components of the acid plant; or

(iv) Blower capacity inadequate to permit the treatment of the full volume of gas which the plant could otherwise accommodate, or in leakage of air into the flues leading to the plant, to the extent that this inadequacy results in bypassing of gas around the plant.

(2) Notwithstanding any contrary provisions of § 57.304(c) (malfunction demonstration), no excess emissions (as defined in § 57.304(a)) shall be considered to have resulted from a malfunction in the constant control system if the smelter owner has not upgraded serious deficiencies in the constant control system in compliance with the requirements of § 57.302(d)(1), unless the smelter owner demonstrates under § 57.304(c) that compliance with those requirements would not have affected the magnitude of the emission.

(e) *Multiple control devices.* (1) At any smelter where off-gas streams are treated by various existing control systems (*e.g.*, multiple acid plants or a DMA scrubber and an acid plant), the NSO shall require the use of those systems in the combination that will result in the maximum feasible net SO_2 removal.

(2) To the extent that compliance with this requirement is demonstrated by the smelter operator to result in excess emissions during unavoidable start up and shut down of the control systems, those excess emissions shall not constitute violations of the NSO.

§ 57.303 Total plantwide emission limitation.

(a) *Calculation of the emission limitation.* Each NSO shall contain a requirement limiting the total allowable emissions from the smelter to the level which would have been associated with production at the smelter's maximum production capacity (as defined in § 57.103(s)) as of August 7, 1977. This limitation shall be expressed in units of mass per time and shall be calculated as the sum of uncontrolled process and fugitive emissions, and emissions from any control systems (operating at the efficiency prescribed under § 57.302). These emission rates may be derived from either direct measurements or appropriately documented mass balance calculations.

(b) *Compliance with the emission limitation.* Each NSO shall require the use of specific, enforceable testing methods and measurement periods for determining compliance with the limitation established under paragraph (a) of this section.

§ 57.304 Bypass, excess emissions and malfunctions.

(a) *Definition of excess emissions.* For the purposes of this subpart, any emissions greater than those permitted by the NSO provisions established under § 57.302 (performance level of interim constant controls) or § 57.303 (plantwide emission limitation) of this subpart shall constitute excess emissions. Emission of any gas stream identified under § 57.301 (a), (b), (c), or (d) of this subpart that is not treated by a sulfur dioxide control system shall also constitute an excess emission under this subpart.

(b) *The excess emission report.* Each NSO shall require the smelter to report all excess emissions to the issuing agency, as provided in § 57.305(b). The report shall include the following:

(1) Identity of the stack or other emission points where the excess emissions occurred;

(2) Magnitude of the excess emissions expressed in the units of each applicable emission limitation, as well as the operating data, documents, and calculations used in determining the magnitude of the excess emissions;

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(3) Time and duration of the excess emissions;

(4) Identity of the equipment causing the excess emissions;

(5) Nature and cause of such excess emissions;

(6) Steps taken to limit the excess emissions, and when those steps were commenced;

(7) If the excess emissions were the result of a malfunction, the steps taken to remedy the malfunction and to prevent the recurrence of such malfunction; and

(8) At the smelter owner's election, the demonstration specified in paragraph (c) of this section.

(c) *Malfunction demonstration.* Except as provided in § 57.302(e)(2) or in paragraph (d) or (e) of this section, any excess emission shall be a violation of the NSO unless the owner demonstrates in the excess emissions report required under paragraph (b) of this section that the excess emission resulted from a malfunction (or an unavoidable start up and shut down resulting from a malfunction) and that:

(1) The air pollution control systems, process equipment, or processes were at all times maintained and operated, to the maximum extent practicable, in a manner consistent with good practice for minimizing emissions;

(2) Repairs were made as expeditiously as practicable, including the use of off-shift labor and overtime;

(3) The amount and duration of the excess emissions were minimized to the maximum extent practicable during periods of such emissions; and

(4) The excess emissions were not part of a recurring pattern indicative of serious deficiencies in, or inadequate operation, design, or maintenance of, the process or control equipment.

(d) *Scheduled maintenance exception.* Excess emissions occuring during scheduled maintenance shall not constitute violations of the NSO to the extent that:

(1) The expected additional annual sulfur dioxide removal by any control system (including associated process changes) for which construction had not commenced (as defined in 40 CFR 60.2(g) and (i)) as of August 7, 1977, and which the smelter owner agrees to install and operate under Subpart F, would have offset such excess emissions if the system had been in operation throughout the year in which the maintenance was performed;

(2) The system is installed and operated as provided in the NSO provisions established under Subpart F; and

(3) The system performs at substantially the expected efficiency and reliability subsequent to its initial break-in period.

(e) An NSO may provide that excess emissions which occur during acid plant start-up as the result of the cooling of acid plant catalyst due to the unavailability of process gas to an acid plant during a prolonged SCS curtailment or scheduled maintenance are not excess emissions. If the NSO does so provide, it shall also require the use of techniques or practices designed to minimize these excess emissions, such as the sealing of the acid plant during prolonged curtailments, the use of auxiliary heat or SO_2 injected during the curtailment, or the preheating of the acid plant before start-up of the process equipment it serves.

[45 FR 42536, June 24, 1980, as amended at 46 FR 18025, Mar. 23, 1981]

§ 57.305 Compliance monitoring and reporting.

(a) *Monitoring.* (1) Each NSO shall require compliance with the control system performance requirements established pursuant to this subpart to be determined through the use of continuous monitors for measuring SO_2 concentration.

(i) Such monitors must be installed, operated and maintained in accordance with the performance specifications and other requirements contained in Appendix D to 40 CFR Part 52 or Part 60. The monitors must take and record at least one measurement of SO_2 concentration from the effluent of each control system in each 15 minute period. Failure of the monitors to record at least 95% of the 15-minute periods in any 30-day period shall constitute a violation of the NSO.

(ii) The sampling point shall be located at least 8 stack diameters (diameter measured at sampling point) downstream and 2 diameters upstream

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from any flow disturbance such as a bend, expansion, constriction, or flame, unless another location is approved by the Administrator.

(iii) The sampling point for monitoring emissions shall be in the duct at the centroid of the cross section if the cross sectional area is less than 4.645m^2 (50 ft^2) or at a point no closer to the wall than 0.914m (3 ft) if the cross sectional area is 4.645m^2 (50 ft^2) or more. The monitor sample point shall be in an area of small spatial concentration gradient and shall be representative of the concentration in the duct.

(iv) The measurement system(s) installed and used pursuant to this paragraph shall be subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per 24-hour operating period unless the manufacturer specifies or recommends calibration at shorter intervals, in which case such specifications or recommendations shall be followed. Records of these procedures shall be made which clearly show instrument readings before and after zero adjustment and calibration.

(v) The use of manual source testing methods (equivalent to 40 CFR Part 60, Appendix A) may also be specified as an acceptable additional (but not alternative) method for making compliance determinations.

(2) Each NSO shall require the monitoring of any ducts or flues used to bypass gases, required under this subpart to be treated by constant controls, around the smelter's sulfur dioxide constant control system(s) for ultimate discharge to the atmosphere. Such monitoring shall be adequate to disclose the time of the bypass, its duration, and the approximate volume of gas bypassed.

(b) *Reporting.* (1) Each NSO shall require that the smelter maintain a record of all measurements required under paragraph (a) of this section. Results shall be summarized monthly and shall be submitted to the issuing agency within 15 days after the end of each month. The smelter owner shall retain a record of such measurements for the duration of the NSO and for as long thereafter as may be necessary for the purpose of including such records in an application for a second NSO.

(2) Each NSO shall require that the smelter maintain a record of all measurements and calculations required under § 57.303(b). Results shall be summarized on a monthly basis and shall be submitted to the issuing agency to 6-month intervals. The smelter owner shall retain a record of such measurements and calculations for the duration of the NSO and for as long thereafter as may be necessary for the purposes of including such information in an application for a second NSO.

(3) The report required under § 57.304(b) shall accompany the report required under paragraph (b)(1) of this section.

Subpart D—Supplementary Control System Requirements

§ 57.401 General requirement.

Except as provided in Subpart E, each NSO shall require the smelter owner to prevent all violations of the NAAQS in the smelter's designated liability area (DLA) through the operation of an approved supplementary control system (SCS).

§ 57.402 Elements of the supplementary control system.

Each supplementary control system shall contain the following elements:

(a) *Air quality monitoring network.* An approvable SCS shall include the use of appropriate ambient air quality monitors to continuously measure the concentration of sulfur dioxide in the air in the smelter's DLA.

(1) The monitors shall be located at all points of expected high SO_2 concentrations necessary to anticipate and prevent possible violations of NAAQS anywhere in the smelter's DLA. The determination of the locations where such concentrations may occur shall take into account all recorded or probable meteorological and operating conditions (including bypassing of control equipment), as well as the presence of other sources of SO_2 significantly affecting SO_2 concentrations in the DLA.

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(2) The number and location of sites shall be based on dispersion modeling, measured ambient air quality data, meteorological information, and the results of the continuing review required by paragraph (f) of this section. The system shall include the use of at least 7 fixed monitors unless the issuing agency determines, on the basis of a demonstration by the smelter owner, that the use of fewer monitors would not limit coverage of points of high SO_2 concentration or otherwise reduce the capability of the smelter owner to prevent all violations of the NAAQS in the smelter's DLA.

(3) All monitors shall be continuously operated and maintained and shall meet the performance specifications contained in 40 CFR Part 53. The monitors shall be capable of routine real time measurement of maximum expected SO_2 concentrations for the averaging times of SO_2 NAAQS.

(b) *Meteorological network.* The SCS must have a meteorological assessment capability adequate to predict and identify local conditions requiring emission curtailment to prevent possible violations of the NAAQS. The meteorological assessment capability shall provide all forecast and current information necessary for successful use of the SCS operational manual required by paragraph (e) of this section.

(c) *Designated liability area.* The system shall be required to prevent all violations of the NAAQS within the smelter's DLA. The DLA of any smelter is the area within which the smelter's emissions may cause or significantly contribute to violations of the NAAQS for SO_2 when the smelter is operating at its maximum production capacity under any recorded or probable meteorological conditions. The boundaries of that area shall be specified in the NSO.

(1) Unless an acceptable demonstration is made under paragraph (c)(2) of this section, the DLA shall be a circle with a center point at the smelter's tallest stack and a minimum radius as given in the following table:

RADIUS FOR SO_2

[Emissions at maximum production capacity[1]]

Emission rate in tons per hour	Emission rate in grams per sec.	Radius in kilometers
16 or less	4,000 or less	11
24	6,000	16
32	8,000	24
40	10,000	32
48 or more	12,000 or more	40

[1]Maximum emission rates for periods not to exceed 24 hours.

Minimum radii may be determined from the table by linear interpolation.

(2) The NSO may provide for a DLA with different boundaries if the smelter owner can demonstrate through the use of appropriate dispersion modeling and ambient air quality monitoring data that the smelter's controlled emissions could not cause or significantly contribute to a violation of the NAAQS beyond the boundaries of such a different area under any recorded or probable meteorological conditions.

(3) A violation of the NAAQS in the DLA of any smelter shall constitute a violation of that smelter's NSO, unless the issuing agency determines on the basis of a showing by the smelter owner that the smelter owner had taken all emission curtailment action indicated by the SCS operational manual and that the violation was caused in significant part by:

(i) Emissions of another source(s) which were in excess of the maximum permissible emissions applicable to such source(s),

(ii) Fugitive emissions of another source(s), or

(iii) Except as provided by § 57.703(a), the smelter's own fugitive emissions: *Provided,* That the smelter is in compliance with all requirements of or under Subpart E of this part.

(4) For the purposes of this section, maximum permissible emissions for other sources are the highest of:

(i) SIP emission limitation

(ii) Orders in effect under section 113(d) of the Clean Air Act; or

(iii) Compliance date extensions under former section 119 of the Clean Air Act (relating to coal conversions).

(d) *Overlapping designated liability areas.* Notwithstanding any other pro-

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visions of this subpart, the following requirements shall apply whenever the designated liability areas of 2 or more smelters do, or may, overlap:

(1) in the case of any NSO applicant that would have a DLA which would overlap with the DLA of any other smelter that has applied for an NSO or has an NSO in effect, the NSO applicant shall include in its application an enforceable joint plan, agreed to by such other smelter(s). In determining whether a joint plan is required, the NSO applicant shall calculate its DLA according to the table in paragraph (c)(1) of this section. The DLA of the other smelter shall be calculated according to the table in paragraph (c)(1) unless the other smelter has an NSO in effect, in which case the boundaries in that NSO shall be used. The enforceable joint plan shall provide for:

(i) Emission curtailment adequate to ensure that the NAAQS will not be violated in any areas of overlapping DLAs; and

(ii) Conclusive prospective allocation of legal liability in the event that the NAAQS are violated in the area of overlapping DLAs.

Such plans may, but need not, include the operation of a joint SCS system. Each NSO shall require adherence by the NSO applicant owner to the joint plan for emission curtailment and allocation of liability, unless the issuing agency determines, pursuant to the provisions of paragraph (c)(2) of this section, that the NSO applicant's DLA does not overlap with that of any other smelter.

(2) In the case of any NSO applicant that would have a DLA which would overlap with the DLA of any other smelter whose owner has not applied for an NSO (and does not have an NSO in effect), the NSO applicant's submittal shall contain a written consent, signed by a corporate official empowered to do so. The consent shall state that if, at any time thereafter, the owner of the other smelter applies for an NSO, and the other smelter's DLA would overlap with the NSO applicant's DLA, the NSO applicant will negotiate and submit an enforceable joint plan for emission curtailment and allocation of liability (as described in paragraph (d)(1) of this section). In determining whether it is necessary to submit such a consent, each smelter's DLA shall be calculated according to the table set forth in paragraph (c)(1) of this section. The consent shall state that a joint plan shall be submitted within 90 days of the issuing agency's notification to the NSO applicant of receipt of the other smelter's letter of intent, unless the issuing agency determines that the DLAs do not overlap. Failure of the NSO applicant to submit such a plan shall constitute grounds for denial of its NSO application or a violation of an effective NSO, as applicable.

(e) *The SCS operational manual.* Each NSO shall require the smelter to be operated in accordance with the provisions of an SCS operational manual approved by the issuing agency. The SCS operational manual shall describe the circumstances under which, the extent to which, and the procedures through which emissions shall be curtailed to prevent violations of the NAAQS in the smelter's DLA. Failure to curtail emissions when and as much as indicated by the manual or to follow the provisions of the manual implementing the requirements of paragraph (e)(3) of this section shall constitute a violation of the NSO.

(1) The operational manual shall prescribe emission curtailment decisions based on the use of real time information from the air quality monitoring network dispersion model estimates of the effect of emissions on air quality, and meteorological observations and predictions.

(2) The operational manual shall also provide for emission curtailment to prevent violation of the NAAQS within the smelter's DLA which may be caused in part by stack emissions, and to the extent practicable fugitive emissions, from any other source (unless that other source is a smelter subject to an NSO).

(3) The SCS operational manual shall include (but not be limited to):

(i) A clear delineation of the authority of the SCS operator to require all other smelter personnel to implement the operator's curtailment decisions;

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(ii) The maintenance and calibration procedures and schedules for all SCS equipment;

(iii) A description of the procedures to be followed for the regular acquisition of all meteorological information necessary to operate the system;

(iv) The ambient concentrations and meteorological conditions that will be used as criteria for determining the need for various degrees of emission curtailment;

(v) The meteorological variables as to which judgments may be made in applying the criteria stated pursuant to paragraph (e)(3)(iv) of this section;

(vi) The procedures through which and the maximum time period within which a curtailment decision will be made and implemented by the SCS operator;

(vii) The method for immediately evaluating the adequacy of a particular curtailment decision, including the factors to be considered in that evaluation;

(viii) The procedures through which and the time within which additional necessary curtailment will immediately be effected; and

(ix) The procedures to be followed to protect the NAAQS in the event of a mechanical failure in any element of the SCS.

(f) *Continuing review and improvement of the SCS.* Each NSO shall require the smelter owner to conduct an active program to continuously review the design and operation of the SCS to determine what measures may be available for improving the performance of the system. Among the elements of this program shall be measures to locate and examine possible places both inside and outside the DLA where unmonitored NAAQS violations may be occurring. Such measures shall include the use of modelling as appropriate and mobile ambient air quality monitors, following up on information and complaints from members of the public, and other appropriate activities. The NSO shall also require the submission of a semi-annual report to the issuing agency detailing the results of this review and specifying measures implemented to prevent the recurrence of any violations of NAAQS.

§ 57.403 Written consent.

(a) *The consent.* The NSO shall include a written consent, signed by a corporate official empowered to do so, in the following form:

As a condition of receiving a Primary Nonferrous Smelter Order (NSO) under section 119 of the Clean Air Act for the smelter operated by (*name of company*) at (*location*), the undersigned official, being empowered to do so, consents for the company as follows:

(1) In any civil proceeding (judicial or administrative) to enforce the NSO, the company will not contest:

(a) Liability for any violation of the National Ambient Air Quality Standards for sulfur dioxide in the smelter's designated liability area (DLA), except on the ground that a determination under 40 CFR 57.402(c)(3) was clearly wrong; or

(b) The conclusive allocation of liability under NSO provisions satisfying 40 CFR 57.402(d)(1) between the company's smelter and any other smelter(s) for any violation of the National Ambient Air Quality Standards for sulfur dioxide in an area of overlapping DLAs.

(2) The issuing agency (as defined in 40 CFR 57.103) will be allowed unrestricted access at reasonable times to inspect, verify calibration of, and obtain data from ambient air quality monitors operated by the company under the requirements of the NSO.

(b) *Rights not waived by the consent.* This consent shall not be deemed to waive any right(s) to judicial review of any provisions of an NSO that are otherwise available to the smelter owner or operator under section 307(b) of the Clean Air Act.

[46 FR 18025, Mar. 23, 1981]

§ 57.404 Measurements, records, and reports.

(a) *Measurements.* Each NSO shall require the smelter owner to install, operate, and maintain a measurement system(s) for continuously monitoring sulfur dioxide emissions and stack gas volumetric flow rates in each stack (except a stack used exclusively for bypassing control equipment) which could emit 5 percent or more of the smelter's total potential (uncon-

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trolled) hourly sulfur dioxide emissions.

(1) Such monitors shall be installed, operated, and maintained in accordance with the performance specifications and other requirements contained in Appendices D and E to 40 CFR Part 52. The monitors must take and record at least one measurement of sulfur dioxide concentration and stack gas flow rate from the effluent of each affected stack in each fifteen-minute period. (The NSO shall require the smelter operator to devise and implement any procedures necessary for compliance with these performance specifications.

(2) The sampling point shall be located at least eight stack diameters (diameter measured at sampling point) downstream and two diameters upstream from any flow disturbance such as a bend, expansion, constriction, or flame, unless another location is approved by the Administrator.

(3) The sampling point for monitoring emissions shall be in the duct at the centroid of the cross section if the cross sectional area is less than 4.645 m^2 (50 ft^2) or at a point no closer to the wall than 0.914m (3ft.) if the cross sectional area is 4.645 m^2 (50 ft^2) or more. The monitor sample point shall be in an area of small spatial concentration gradient and shall provide a sample which is representative of the concentration in the duct.

(4) The measurement system(s) installed and used pursuant to this paragraph shall be subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per 24-hour operating period unless the manufacturer specifies or recommends calibration at shorter intervals, in which case such specifications or recommendations shall be followed. Records of these procedures shall be made which clearly show instrument readings before and after zero adjustment and calibration.

(5) The results of such monitoring, calibration, and maintenance shall be submitted in the form and with the frequency specified in the NSO.

(b) *Records.* Each NSO shall require the smelter owner to maintain records of the air quality measurements made, meteorological information acquired, emission curtailment ordered (including the identity of the persons making such decisions), and calibration and maintenance performed on SCS monitors during the operation of the SCS. These records shall be maintained for the duration of the NSO, and for as long thereafter as may be necessary for purposes of applying for a second NSO, and shall be furnished to the issuing agency upon request.

(c) *Reports.* Each NSO shall require the smelter owner to:

(1) Submit a monthly summary indicating all places and times at which the NAAQS for SO_2 were violated in the smelter's DLA, and stating the SO_2 concentrations at such times;

(2) Immediately notify EPA and the state agency any time concentrations of SO_2 in the ambient air in the smelter's DLA reaches 0.3 part per million (800 micrograms/cubic meter), 24-hour average, or exceed the warning stage in any more stringent emergency plan in the applicable state implementation plan; and

(3) Make such other reports as may be specified in the NSO.

§ 57.405 Formulation, approval, and implementation of requirements.

(a) *SCS content of the application.* The requirements of § 57.203(d) shall be satisfied with respect to this subpart as follows:

(1) Each NSO application shall include a complete description of any supplementary control system in operation at the smelter at the time of application and a copy of any SCS operational manual in use with that system.

(2) Each NSO application shall contain proposed NSO provisions for compliance with the requirements of §§ 57.401, 57.402 (c), (d), and (f), 57.403, 57.404, and 57.405(b)(2).

(3) Each NSO application shall include a specific plan for the development of a system fulfilling the requirements of § 57.402 (a), (b), and (e) (covering air quality monitoring network, meteorological network, and the SCS operational manual).

(b) *SCS content of the order.* (1) Each NSO shall include an approved version of the plan described in para-

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graph (a)(3) of this section and shall provide increments of progress towards its completion.

(2) Each NSO shall require the submission of a final report evaluating the performance and adequacy of the SCS developed pursuant to the approved plan. The report shall include:

(i) A detailed description of how the criteria that form the basis for particular curtailment decisions were derived;

(ii) A complete description of each SCS element listed in § 57.402 (a) through (d) (covering monitoring, meteorology, and the DLA), and an explanation of why the elements fulfill the requirements of those sections;

(iii) A reliability study demonstrating that the SCS will prevent violations of the NAAQS in the smelter's DLA at all times. The reliability study shall include a comprehensive analysis of the system's operation during one or more three-month seasonal periods when meteorological conditions creating the most serious risk of NAAQS violations are likely to occur; and

(iv) A copy of the current SCS operational manual.

(c) *Amendment of the NSO.* Each NSO shall be amended, after the submission of the final report required under paragraph (b)(2) of this section, to reflect the most current approved elements of the SCS and to fulfill all other requirements of this subpart. Each NSO shall also be subsequently amended (as provided in § 57.104) whenever necessary as a result of the program required by § 57.402(f) or to reflect improved SCS operating procedures or other system requirements.

Subpart E—Fugitive Emission Evaluation and Control

§ 57.501 General Requirement.

Each NSO shall require the smelter owner to use such control measures as may be necessary to ensure that the smelter's fugitive emissions do nct result in violations of the NAAQS for SO_2 in the smelter's DLA.

§ 57.502 Evaluation.

(a) *Evaluation at the time of application.* Any smelter owner may demonstrate at the time of application for an NSO that the smelter's SO_2 fugitive emissions will not cause or significantly contribute to violations of the NAAQS in the smelter's DLA. If such demonstration is not made, the smelter owner shall submit the design and workplan for a study adequate to assess the sources of significant fugitive emissions from the smelter and their effects upon ambient air quality.

(b) *Evaluation during the first 6 months of the NSO.* The design and workplan of the study shall be approved by the issuing agency and included in the NSO. The study shall commence upon the date when the NSO becomes effective, and an analysis of its results shall be submitted to the issuing agency within the time provided by the NSO. The study shall include an appropriate period during which the ambient air shall be monitored to determine the impact of fugitive emissions of sulfur dioxide, arsenic (at copper smelters only), lead (at lead and zinc smelters only), and total suspended particulates on the ambient air quality in the smelter's DLA.

§ 57.503 Control measures.

The NSO of any smelter subject to the requirements of § 57.502(b) shall be amended as provided in § 57.704(d) to implement the requirement of § 57.501. Measures required to be implemented may include:

(a) *Additional supplementary control.* The use of the supplementary control system, if the additional use of the system does not interfere with the smelter owner's ability to meet the requirements of Subpart D; and

(b) *Engineering and maintenance techniques.* The use of engineering and maintenance techniques to detect and prevent leaks and capture and vent fugitive emissions through appropriate stacks. These techniques include but are not limited to:

(1) For reactors, installation and proper operation of primary hoods;

(2) For roasters, installation and proper operation of primary hoods on all hot calcine transfer points;

(3) For furnaces, installation and proper operation of primary hoods on

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all active matte tap holes, matte launders, slag skim bays, and transfer points;

(4) For converters, installation and proper operation of primary hoods for blowing operations, and where appropriate, secondary hoods for charging and pouring operations;

(5) For sintering machines, installation and proper operation of primary hoods on the sinter bed, all hot sinter ignition points, all concentrate laydown points, and all hot sinter transfer points;

(6) For blast furnaces, installation and proper operation of primary hoods on all active slag and lead bullion furnace tap holes and transfer points;

(7) For dross reverberatory furnaces, installation and proper operation of primary hoods on all active charging and discharging points;

(8) Maintenance of all ducts, flues and stacks in a leak-free condition to the maximum extent possible;

(9) Maintenance of all process equipment under normal operating conditions in such a fashion that out-leakage of fugitive gases will be prevented to the maximum extent possible;

(10) Secondary or tertiary hooding on process equipment where necessary; and

(11) Partial or complete building evacuation as appropriate.

Subpart F—Research and Development Requirements

§ 57.601 General requirement.

Each NSO shall require the smelter to conduct or participate in a specific research and development program designed to develop more effective means of compliance with the sulfur dioxide control requirements of the applicable state implementation plan than presently exist.

§ 57.602 Approval of proposal.

(a) *The smelter owner's proposal.* The smelter owner's NSO application shall include a proposed NSO provision for implementing the requirement of § 57.601, a fully documented supporting analysis of the proposed program, and an evaluation of the consistency of the proposed program with the criteria listed in § 57.603. The application shall also specify:

(1) The design and substantive elements of the research and development program, including the expected amount of time required for their implementation;

(2) The annual expected capital, operating, and other costs of each element in the program;

(3) The smelter's current production processes, pollution control equipment, and emissions which are likely to be affected by the program;

(4) Potential or expected benefits of the program;

(5) The basis upon which the results of the program will be evaluated; and

(6) The names, positions, and qualifications of the individuals responsible for conducting and supervising the project.

(b) *EPA approval.* If the issuing agency will not be EPA, the smelter owner or the issuing agency may also submit to EPA the information specified in paragraph (a) of this section at the same time the information is submitted to the issuing agency. As soon as possible after the receipt of the information described in paragraph (a) of this section, EPA shall certify to the issuing agency and to the applicant whether or not in the judgment of the Administrator the smelter owner's final proposals are approvable.

(c) *Optional preproposal.* The smelter owner may, at its option, submit to EPA for its approval and comment a preproposal generally describing the project the owner intends to propose under paragraph (a) of this section. A preproposal may be submitted to EPA at any time prior to the submission of a proposal under paragraph (a) of this section. As soon as possible after the receipt of a preproposal, EPA shall certify to the applicant (and to any other issuing agency, as applicable) whether or not the project would be approvable. This certification may include comments indicating necessary modifications which would make the project approvable.

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§ 57.603 Criteria for approval.

The approvability of any proposed research and development program shall be judged primarily according to the following criteria:

(a) The likelihood that the project will result in the use of more effective means of emission limitation by the smelter within a reasonable period of time;

(b) Whether the proposed funding and staffing of the project appear adequate for its successful completion;

(c) Whether the proposed level of funding for the project is consistent with the research and development expenditure levels for pollution control found in other industries;

(d) The potential that the project may yield industrywide pollution control benefits;

(e) Whether the project may also improve control of other pollutants of both occupational and environmental significance;

(f) The potential effects of the project on energy conservation; and

(g) Other non-air quality health and environmental considerations.

§ 57.604 Evaluation of projects.

In any case where the proposed research and development project is to be conducted wholly by one or more smelter owners, the owner's proposal shall include a provision for the employment of a qualified independent engineering firm to evaluate and prepare written reports at least annually and, in any case, on each completed significant stage of the program. In any other case, the proposal shall contain a provision for the preparation of such reports by the person conducting any portion of the project. All reports required by this paragraph shall be submitted to EPA and also to the issuing agency if it is not EPA.

§ 57.605 Consent.

Each NSO shall incorporate by reference a binding written consent, signed by a corporate official empowered to do so, requiring the smelter owner to:

(a) Carry out the approved research and development program;

(b) Grant each issuing agency and their contractors access to any information or data employed or generated in the research and development program, including any process, emissions, or financial records which such agency determines are needed to evaluate the technical or economic merits of the program;

(c) Grant physical access to representatives and contractors of each issuing agency to each facility at which such research is conducted;

(d) Grant the representatives and contractors of EPA and the issuing agency reasonable access to the persons conducting the program on behalf of the smelter owner for discussions of progress, interpretation of data and results, and any other similar purposes as deemed necessary by any issuing agency.

§ 57.606 Confidentiality.

The provisions of section 114 of the Act and 40 CFR Part 2 shall govern the confidentiality of any data or information provided to EPA under this subpart.

Subpart G—Compliance Schedule Requirements

§ 57.701 General requirements.

Each NSO shall require the smelter owner to meet all of the requirements of the NSO as expeditiously as practicable. All NSO requirements shall be immediately effective, except to the extent that the owner is able to demonstrate the necessity for additional time. For requirements not immediately effective, the NSO shall provide increments of progress and schedules for compliance. The schedules set forth in this subpart represent the most expeditious compliance practicable only for those smelters which do not currently have the equipment or systems required by this part.

§ 57.702 Compliance with constant control emission limitation.

Where necessary, each NSO shall require the smelter owner to submit to the issuing agency, within 30 days of the effective date of the NSO, a proposed scheduled for compliance with the requirements of Subpart C. No final compliance date shall extend

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beyond 14 months of the effective date of the NSO, except: For a smelter having no constant controls installed on the effective date, or where the smelter operator demonstrates that special circumstances require more time. The schedule shall include the following increments of progress:

(a) The date by which contracts will be let or purchase orders issued to accomplish any necessary performance improvements;

(b) The date for initiating on-site construction or installation of necessary equipment;

(c) The date by which on-site construction or installation of equipment is to be completed; and

(d) The date for achievement of final compliance with emission limitations.

§ 57.703 Compliance with the supplementary control system requirements.

(a) *Operations of existing SCS.* Each NSO shall require the immediate operation of any existing supplementary control system and the assumption of liability for violations of the NAAQS at existing monitor sites.

(b) *Compliance schedule where no SCS exists.* Where necessary, the NSO shall also require compliance with the requirements of Subpart D to be achieved according to the following schedule:

(1) Within 6 months after issuance of the NSO the smelter shall install all operating elements of the system, begin operating the system, complete all other measures specified in its approved SCS development plan, and begin compliance with the requirements of § 57.404.

(2) Within 9 months thereafter the smelter shall submit the SCS Report, assume liability for all violations of the NAAQS within its designated liability area, and comply with all other requirements of Subpart D.

§ 57.704 Compliance with fugitive emission evaluation and control requirements.

(a) *Plan for fugitive emission control.* The NSO shall provide that within a reasonable period after the submission of the report on the fugitive emission control study required by § 57.502(b), the smelter owner shall submit to the issuing agency for its approval a proposed fugitive emission control plan, including increments of progress, for compliance with the requirements of §§ 57.501 and 57.503.

(b) *SCS Report.* If the fugitive emission control plan submitted under paragraph (a) of this section proposes to meet the requirements of §§ 57.501 and 57.503 through the additional use of a supplementary control system, the plan shall demonstrate that the use of supplementary controls at that smelter to prevent violations of the NAAQS resulting from fugitive emissions is practicable, adequate, reliable, and enforceable. The plan shall contain increments of progress providing for completion of the implementation of each additional measure, and for corresponding compliance with the requirements of paragraphs (b) and (c) of § 57.404, within four months of approval of the plan by the issuing agency. The plan shall also provide that within three months after completion of implementation of those additional measures, the smelter shall fully comply with the requirements of §§ 57.401 and 57.501 (including the assumption of liability for violations of NAAQS within its designated liability area), and shall submit an additional SCS report for the approval of the issuing agency. This additional final report shall correspond to that submitted under § 57.40(b)(2), except that it need not contain the 3 month study described in § 57.405(b)(2)(iii).

(c) *NSO amendment.* The amendments of the NSO required under § 57.503 shall be effected by the issuing agency as follows:

(1) With respect to the additional use of SCS, upon approval or promulgation of the plan submitted under paragraph (a) of this section and upon approval or promulgation of the requirements for the system described in the additional SCS Report under paragraph (a) of this section;

(2) With respect to the additional use of engineering techniques, upon approval or promulgation of the compliance schedule required by paragraph (a) of this section.

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Subpart H—Waiver of Interim Requirement for Use of Continuous Emission Reduction Technology

§ 57.801 Purpose and scope.

(a) This subpart shall govern all proceedings for the waiver of the interim requirement that each NSO provide for the use of constant controls.

(b) In the absence of specific provisions in this subpart, and where appropriate, questions arising at any stage of the proceeding shall be resolved at the discretion of the Presiding Officer or the Administrator, as appropriate.

§ 57.802 Request for waiver.

(a) *General.* (1) Each smelter owner requesting a waiver shall compete, sign and submit Appendix A to this part. Copies of Appendix A may be obtained from any EPA Regional Administrator, or from the Director, Division of Stationary Source Enforcement (EN-341), United States Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460. Claims of confidentially shall be made as provided in § 57.203.

(2) The smelter owner shall append to the completed and signed Appendix A full copies of all documents, test results, studies, reports, scientific literature and assessments required by Appendix A. To the extent that the material consists of generally available published material, the smelter owner may cite to the material in lieu of appending it to Appendix A. The smelter owner shall specifically designate those portions of any documents relied upon and the facts or conclusions in Appendix A to which they relate.

(b) *Effect of submitting incomplete application.* (1) The Administrator, or a person designated by him to review applications for waivers, may advise the smelter owner in writing whenever he determines that additional information is needed in order to make the waiver eligibility determinations required by Section 119(d)(2) of the Act. The smelter owner shall promptly supply such information. All additional information requested under this paragraph and filed in the manner required by paragraph (d) shall be deemed part of Appendix A.

(2) Failure to comply with the requirements of paragraphs (a) and (b)(1) of this section shall be grounds for denial of the requested waiver.

(c) *Time for requesting waivers.* Any request for a waiver must be submitted to the Administrator by the smelter owner at the time of the initial application for an NSO from the State or the Administrator, as the case may be.

(d) *Submission of request.* A copy of Appendix A (plus attachments) which has been completed for the purpose of requesting a waiver of constant control requirements shall be filed with the Administrator, addressed as follows:

Director, Division of Stationary Source Enforcement (EN-341), U.S. Environmental Protection Agency, 401 M St., SW., Washington, D.C. 20460, Attn: Confidential Information Unit.

(e) *Eligibility.* No smelter shall be eligible for consideration under this subpart unless no constant controls were installed at that smelter as of August 7, 1977.

(f) *Criteria for Decision.* The Administrator shall grant or approve a waiver, whichever is appropriate, for any eligible smelter as to which he finds, in accordance with the methods and procedures specified in Appendix A, that:

(1) The sum of the present value of the smelter's future net cash flow (after installation of interim constant control equipment) plus its terminal value would be less than the smelter's liquidation (salvage) value; or

(2) The smelter's average variable costs at all relevent levels of production (after installation of interim constant control equipment) would exceed the weighted average price of smelter output for one year or more.

§ 57.803 Issuance of tentative determination; notice.

(a) *Tentative determination.* (1) The EPA staff shall formulate and prepare:

(i) A "Staff Computational Analysis," using the financial information submitted by the smelter owner under § 57.802 to evaluate the economic circumstances of the smelter for which the waiver is sought;

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(ii) A tentative determination as to whether an interim requirement for the use of constant controls would be so costly as to necessitate permanent or prolonged temporary cessation of operations at the smelter for which the waiver is requested. The tentative determination shall contain a "Proposed Report and Findings" summarizing the conclusions reached in the Staff Computational Analysis, discussing the estimated cost of interim controls, and assessing the effect upon the smelter of requiring those controls. The tentative determination shall also contain a proposed recommendation that the waiver be granted or denied, based upon the Proposed Report and Findings, and stating any additional considerations supporting the proposed recommendation. This tentative determination shall be a public document.

(2) In preparing the Proposed Report and Findings, the EPA staff shall attempt to the maximum extent feasible to avoid revealing confidential information which, if revealed, might damage the legitimate business interests of the applicant. The preceding sentence notwithstanding, the tentative determination shall be accompanied by a listing of all materials considered by EPA staff in developing the tentative determination. Subject to the provisions of § 57.814(a), full copies of all such materials shall be included in the administrative record under § 57.814, except that, to the extent the material consists of published material which is generally available, full citations to that material may be given instead.

(b) *Public notice.* Public notice of EPA's tentative determination to grant or deny an application for a waiver shall be given by:

(1) Publication at least once in a daily newspaper of general circulation in the area in which the smelter is located; and

(2) Posting in the principal office of the municipality in which the smelter is located.

(c) *Individual notice.* Individual notice of EPA's tentative determination to grant or deny an application for a waiver shall be mailed to the smelter owner by certified mail, return receipt requested, and to the air pollution control agency for the State in which the smelter is located.

(d) *Request for individual notice.* EPA shall mail notice of its tentative determination to grant or deny an application for waiver to any person upon request. Each such request shall be submitted to the Administrator in writing, shall state that the request is for individual notice of tentative determination to grant or deny any application for a waiver under section 119(d) of the Clean Air Act, and shall describe the notice or types of notices desired (*e.g.*, all notices, notices for a particular Region, notices for a particular State, notice for a particular city).

(e) *Form of notice.* The notice of tentative determination required to be distributed under paragraphs (b), (c), and (d) of this section shall include, in addition to any other materials, the following:

(1) A summary of the information contained in Appendix A;

(2) The tentative determination prepared under paragraph (a) of this section: *Provided,* That, except in the case of the smelter owner, a summary of the basis for the grant or denial of the waiver may be provided in lieu of the formal determinations required by paragraph (a)(1) of this section;

(3) A brief description of the procedures set forth in § 57.804 for requesting a public hearing on the waiver request, including a statement that such request must be filed within 30 days of the date of the notice;

(4) A statement that written comments on the tentative determination submitted to EPA within 60 days of the date of the notice will be considered by EPA in making a final decision on the application; and

(5) The location of the administrative record and the location at which interested persons may obtain further information on the tentative determination, including a copy of the index to the record, the tentative determination prepared under paragraph (a) of this section, and any other non-confidential record materials.

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§ 57.804 Request for hearing; request to participate in hearing.

(a) *Request for hearing.* Within 30 days of the date of publication or receipt of the notice required by § 57.803, any person may request the Administrator to hold a hearing on the tentative determination by submitting a written request containing the following:

(1) Identification of the person requesting the hearing and his interest in the proceeding;

(2) A statement of any objections to the tentative determination; and

(3) A statement of the issues which such person proposes to raise for consideration at such hearing.

(b) *Grant or denial of hearing; notification.* Whenever (1) the Administrator has received a written request satisfying the requirements of paragraph (a) of this section which presents genuine issues as to the effect on the smelter of the requirement for use of constant controls, or (2) the Administrator determines in his discretion that a hearing is necessary or appropriate, the Administrator shall give written notice of his determination to each person requesting such hearing and the smelter owner, and shall provide public notice of his determination in accordance with § 57.803(b). If the Administrator determines that a request filed under paragraph (a) of this section does not comply with the requirements of paragraph (a) or does not present genuine issues, he shall give written notice of his decision to deny a hearing to the person requesting the hearing.

(c) *Form of notice of hearing.* Each notice of hearing disseminated under paragraph (b) of this section shall contain:

(1) A statement of the time and place of the hearing;

(2) A statement identifying the place at which the official record on the application for waiver is located, the hours during which it will be open for public inspection, and the documents contained in the record as of the date of the notice of hearing;

(3) The due date for filing a written request to participate in the hearing under paragraph (d) of this section;

(4) The due date for making written submissions under § 57.805; and

(5) The name, address, and office telephone number of the hearing Clerk for the hearing.

(d) *Request to participate in hearing.* Each person desiring to participate in any hearing granted under this section, including any person requesting such a hearing, shall file a written request to participate with the Hearing Clerk by the deadline set forth in the notice of hearing. The request shall include:

(1) A brief statement of the interest of the person in the proceeding;

(2) A brief outline of the points to be addressed;

(3) An estimate of the time required; and

(4) If the request is submitted by an organization, a nonbinding list of the persons to take part in the presentation. As soon as practicable, but in no event later than two weeks before the scheduled date of the hearing, the Hearing Clerk shall make available to the public and shall mail to each person who asked to participate in the hearing a hearing schedule.

(e) *Effect of denial of or absence of request for hearing.* If no request for a hearing is made under this section, or if all such requests are denied under paragraph (b) of this section, the tentative determination issued under § 57.803 shall be treated procedurally as if it were a recommended decision issued under § 57.811(b)(2), except that for purposes of §§ 57.812 and 57.813 the term "hearing participant" shall be construed to mean the smelter owner and any person who submitted comments under § 57.803(e)(4).

§ 57.805 Submission of written comments on tentative determination.

(a) *Main comments.* Each person who has filed a request to participate in the hearing shall file with the Hearing Clerk no later than 30 days before the scheduled start of the hearing (or such other date as may be set forth in the notice of hearing) any comments which he has on the request for waiver and EPA's tentative determination, based on information which is or

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reasonably could have been available to that person at the time.

(b) *Reply comments.* Not later than two weeks after a full transcript of the hearing becomes available (or such other date as may be set forth in the notice of hearing), each person who has filed a request to participate in the hearing shall file with the Hearing Clerk any comments he may have on:

(1) Written comments submitted by other participants pursuant to paragraph (a) of this section;

(2) Written comments submitted in response to the notice of hearing;

(3) Material in the hearing record; and

(4) Material which was not and could not reasonably have been available prior to the deadline for submission of main comments under paragraph (a) of this section.

(c) *Form of comments.* All comments should be submitted in quadruplicate and shall include any affidavits, studies, tests or other materials relied upon for making any factual statements in the comments.

(d) *Use of comments.* (1) Written comments filed under this section shall constitute the bulk of the evidence submitted at the hearing. Oral statements at the hearing should be brief, and restricted either to points that could not have been made in written comments, or to emphasizing points which are made in the comments, but which the participant believes can be more forcefully urged in the hearing context.

(2) Notwithstanding the foregoing, within two weeks prior to either deadline specified by paragraph (a) of this section for the filing of main comments, any person who has filed a request to participate in the hearing may file a request with the Presiding Officer to submit all or part of his main comments orally at the hearing in lieu of submitting written comments. The Presiding Officer shall, within one week, grant such request if he finds that such person will be prejudiced if he is required to submit such comments in written form.

§ 57.806 Presiding Officer.

(a) *Assignment of Presiding Officer.* (1) The Administrator shall, as soon as practicable after the granting of a request for hearing under § 57.803:

(i) Appoint a Presiding Officer to chair the hearing panel, who shall be either the Assistant Administrator for Air and Waste Management or the Assistant Administrator for Enforcement; or

(ii) Request that the Chief Administrative Law Judge assign an Administrative Law Judge as Presiding Officer. The Chief Administrative Law Judge shall thereupon make the assignment.

(2) If all parties to the hearing waive their right to have the Agency or an Administrative Law Judge preside at the hearing, the Administrator shall appoint an EPA employee having the qualifications of a Judicial Officer as defined in § 57.103 to serve as Presiding Officer.

(b) *Powers and duties of Presiding Officer.* It shall be the duty of the Presiding Officer to conduct a fair and impartial hearing, assure that the facts are fully elicited, and avoid delay. The Presiding Officer shall have authority to:

(1) Chair and conduct administrative hearings held under this subpart;

(2) Administer oaths and affirmations;

(3) Receive relevant evidence: *Provided,* That the administrative record, as defined in § 57.814, shall be received in evidence;

(4) Consider and rule upon motions, dispose of procedural requests, and issue all necessary orders;

(5) Hold conferences for the settlement or simplification of the issues or the expediting of the proceedings; and

(6) Do all other acts and take all measures necessary for the maintenance of order and for the efficient, fair and impartial conduct of proceedings under this subpart.

§ 57.807 Hearing.

(a) *Composition of hearing panel.* The Presiding Officer shall preside at the hearing held under this subpart. An EPA panel shall also take part in the hearing. In general, the membership of the panel shall consist of EPA employees having special expertise in areas related to the issues to be addressed at the hearing, including

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economists and engineers. For this reason, the membership of the panel may change as different issues are presented for discussion.

(b) *Additional hearing participants.* Either before or during the hearing, the Presiding Officer, after consultation with the panel, may request that a person not then scheduled to participate in the hearing (including an EPA employee or a person identified by any scheduled hearing participant as having knowledge concerning the issues raised for discussion at the hearing) make a presentation or make himself available for cross-examination at the hearing.

(c) *Questioning of hearing participants.* The panel members may question any person participating in the hearing. Cross-examination by persons other than panel members shall not be permitted at this stage of the proceeding except where the Presiding Officer determines, after consultation with the panel, that circumstances compel such cross-examination. However, persons in the hearing audience, including other hearing participants, may submit written questions to the Presiding Officer for the Presiding Officer to ask the participants, and the Presiding Officer may, after consultation with the panel, and in his sole discretion, ask these questions.

(d) *Submission of additional material.* Participants in the hearing shall submit for the hearing record such additional material as the hearing panel may request within 10 days following the close of the hearing, or such other period of time as is ordered by the Presiding Officer. Participants may also submit additional information for the hearing record on their own accord within 10 days after the close of the hearing.

(e) *Transcript.* A verbatim transcript shall be made of the hearing.

§ 57.808 Opportunity for cross-examination.

(a) *Request for cross-examination.* After the close of the panel hearing conducted under this part, any participant in that hearing may submit a written request for cross-examination. The request shall be received by EPA within one week after a full transcript of the hearing becomes available and shall specify:

(1) The disputed issue(s) of material fact as to which cross-examination is requested. This shall include an explanation of why the questions at issue are factual, rather than of an analytical or policy nature; the extent to which they are in dispute in the light of the record made thus far, and the extent to which and why they can reasonably be considered material to the decision on the application for a waiver; and

(2) The person(s) the participant desires to cross-examine, and an estimate of the time necessary. This shall include a statement as to why the cross-examination requested can be expected to result in full and true disclosure resolving the issue of material fact involved.

(b) *Order granting or denying request for cross-examination.* As expeditiously as practicable after receipt of all requests for cross-examination under paragraph (a) of this section, the Presiding Officer, after consultation with the hearing panel, shall issue an order either granting or denying each such request, which shall be disseminated to all persons requesting cross-examination and all persons to be cross-examined. If any request for cross-examination is granted, the order shall specify:

(1) The issues as to which cross-examination is granted;

(2) The persons to be cross-examined on each issue;

(3) The persons allowed to conduct cross-examination;

(4) Time limits for the examination of witnesses; and

(5) The date, time and place of the supplementary hearing at which cross-examination shall take place. In issuing this ruling, the Presiding Officer may determine that one or more participants have the same or similar interests and that to prevent unduly repetitious cross-examination, they should be required to choose a single representative for purposes of cross-examination. In such a case, the order shall simply assign time for cross-examination by that single representative without identifying the representative further.

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(c) *Supplementary hearing.* The Presiding Officer and at least one member of the original hearing panel shall preside at the supplementary hearing. During the course of the hearing, the Presiding Officer shall have authority to modify any order issued under paragraph (b) of this section. A verbatim transcript shall be made of this hearing.

(d) *Alternatives to cross-examination.* (1) No later than the time set for requesting cross-examination, a hearing participant may request that alternative methods of clarifying the record (such as the submittal of additional written information) be used in lieu of or in addition to cross-examination. The Presiding Officer shall issue an order granting or denying such request at the time he issues (or would have issued) an order under paragraph (b) of this section. If the request is granted, the order shall specify the alternative provided and any other relevant information (*e.g.*, the due date for submitting written information).

(2) In passing on any request for cross-examination submitted under paragraph (a) of this section, the Presiding Officer may, as a precondition to ruling on the merits of such request, require that alternative means of clarifying the record be used whether or not a request to do so has been made under the preceding paragraph. The person requesting cross-examination shall have one week to comment on the results of utilizing such alternative means, following which the Presiding Officer, as soon as practicable, shall issue an order granting or denying such person's request for cross-examination.

§ 57.809 Ex parte communications.

(a) *General.* (1) No interested person outside the Agency or member of the Agency trial staff shall make or knowingly cause to be made to any member of the decisional body an *ex parte* communication relevant to the merits of the proceedings.

(2) No member of the decisional body shall make or knowingly cause to be made to any interested person outside the Agency or member of the Agency trial staff an *ex parte* communication relevant to the merits of the proceedings.

(b) *Effect of receipt of ex parte communication.* (1) A member of the decisional body who receives or who makes or knowingly causes to be made a communication prohibited by this subsection shall place in the record all written communications or memoranda stating the substance of all oral communications together with all written responses and memoranda stating the substance of all oral responses.

(2) Upon receipt by any member of the decisionmaking body of an *ex parte* communication knowingly made or knowingly caused to be made by a party or representative of a party in violation of this section, the person presiding at the stage of the hearing then in progress may, to the extent consistent with justice and the policy of the Clean Air Act, require the party to show cause why its claim or interest in the proceedings should not be dismissed, denied, disregarded, or otherwise adversely affected on account of such violation.

(c) *Definitions.* For purposes of this section, the following definitions shall apply:

(1) "Agency trial staff" means those Agency employees, whether temporary or permanent, who have been designated by the Agency as available to investigate, litigate, and present the evidence, arguments and position of the Agency in the evidentiary hearing or non-adversary panel hearing. Appearance as a witness does not necessarily require a person to be designated as a member of the Agency trial staff;

(2) "Decisional body" means any Agency employee who is or may reasonably be expected to be involved in the decisional process of the proceeding including the Administrator, Judicial Officer, Presiding Officer, the Regional Administrator (if he does not designate himself as a member of the Agency trial staff), and any of their staff participating in the decisional process. In the case of a non-adversary panel hearing, the decisional body shall also include the panel members whether or not permanently employed by the Agency;

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(3) "*Ex parte* communication" means any communication, written or oral, relating to the merits of the proceeding between the decisional body and an interested person outside the Agency or the Agency trial staff which was not originally filed or stated in the administrative record or in the hearing. *Ex parte* communications do not include:

(i) Communications between Agency employees other than between the Agency trial staff and the member of the decisional body;

(ii) Discussions between the decisional body and either:

(A) Interested persons outside the Agency, or;

(B) The Agency trial staff *if* all parties have received prior written notice of such proposed communications and have been given the opportunity to be present and participate therein.

(4) "Interested person outside the Agency" includes the smelter owner, any person who filed written comments in the proceeding, any person who requested the hearing, any person who requested to participate or intervene in the hearing, any participant or party in the hearing and any other interested person not employed by the Agency at the time of the communications, and the attorney or record for such persons.

§ 57.810 Filing of briefs, proposed findings, and proposed recommendations.

Unless otherwise ordered by the Presiding Officer, each hearing participant may, within 20 days after reply comments are submitted under § 57.805(b), or if a supplemental hearing for the purpose of cross-examination has been held under § 57.808(c), within 20 days after the transcript of such supplemental hearing becomes available, or if alternative methods of clarifying the record have been used under § 57.808(d), within 20 days after the alternative methods have been employed, file with the Hearing Clerk and serve upon all other hearing participants proposed findings and proposed recommendations to replace in whole or in part the findings and recommendations contained in the tentative determination. Any such person may also file, at the same time, a brief in support of his proposals, together with references to relevant pages of transcript and to relevant exhibits. Within 10 days thereafter each participant may file a reply brief concerning alternative proposals. Oral argument may be held at the discretion of the Presiding Officer on motion of any hearing participant or sua sponte.

§ 57.811 Recommended decision.

As soon as practicable after the conclusion of the hearing, one or more responsible employees of the Agency shall evaluate the record for preparation of recommended decision and shall prepare and file a recommended decision with the Hearing Clerk. The employee(s) preparing the decision will generally be members of the hearing panel and may include the Presiding Officer. Such employee(s) may consult with and receive assistance from any member of the hearing panel in drafting a recommended decision and may also delegate the preparation of the recommended decision to the panel or to any member or members of it. This decision shall contain the same elements as the tentative determination. After the recommended decision has been filed, the Hearing Clerk shall serve a copy of such decision on each hearing participant and upon the Administrator.

§ 57.812 Appeal from or review of recommended decision.

(a) *Exceptions.* (1) Within 20 days after service of the recommended decision, any hearing participant may take exception to any matter set forth in such decision or to any adverse order or ruling of the Presiding Officer prior to or during the hearing to which such participant objected, and may appeal such exceptions to the Administrator by filing them in writing with the Hearing Clerk. Such exceptions shall contain alternative findings and recommendations, together with references to the relevant pages of the record and recommended decision. A copy of each document taking exception to the recommended decision shall be served upon every other hearing participant. Within the same period of time each party filing excep-

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tions shall file with the Administrator and shall serve upon all hearing participants a brief concerning each of the exceptions being appealed. Each brief shall include page references to the relevant portions of the record and to the recommended decision.

(2) Within 10 days of the service of exceptions and briefs under paragraph (a)(1) of this section, any hearing participant may file and serve a reply brief responding to exceptions or arguments raised by any other hearing participant together with references to the relevant portions of the record, recommended decision, or opposing brief. Reply briefs shall not, however, raise additional exceptions.

(b) *Sua sponte review by the Administrator.* Whenever the Administrator determines sua sponte to review a recommended decision, notice of such intention shall be served upon the parties by the Hearing Clerk within 30 days after the date of service of the recommended decision. Such notice shall include a statement of issues to be briefed by the hearing participants and a time schedule for the service and filing of briefs.

(c) *Scope of appeal or review.* The appeal of the recommended decision shall be limited to the issues raised by the appellant, except when the Administrator determines that additional issues should be briefed or argued. If the Administrator determines that briefing or argument of additional issues is warranted, all hearing participants shall be given reasonable written notice of such determination to permit preparation of adequate argument.

(d) *Argument before the Administrator.* The Administrator may, upon request by a party or sua sponte, set a matter for oral argument. The time and place for such oral argument shall be assigned after giving consideration to the convenience of the parties.

§ 57.813 Final decision.

(a) *After review.* As soon as practicable after all appeal or other review proceedings have been completed, the Administrator shall issue his final decision. Such a final decision shall include the same elements as the recommended decision, as well as any additional reasons supporting his decisions on exceptions filed by hearing participants. The final decision may accept or reject all or part of the recommended decision. The Administrator may consult with the Presiding Officer, members of the hearing panel or any other EPA employee in preparing his final decision. The Hearing Clerk shall file a copy of the decision on all hearing participants.

(b) *In the absence of review.* If no party appeals a recommended decision to the Administrator and if the Administrator does not review it sua sponte, he shall be deemed to have adopted the recommended decision as the final decision of the Agency upon the expiration of the time for filing any exceptions under § 57.812(a).

(c) *Timing of judicial review.* For purposes of judicial review, final Agency action on a request for a waiver of the interim requirement that each NSO provide for the use of constant controls shall not occur until EPA approves or disapproves the issuance of an NSO to the source requesting such a waiver.

§ 57.814 Administrative record.

(a) *Establishment of record.* (1) Upon receipt of request for a waiver, an administrative record for that request shall be established, and a Record and Hearing Clerk appointed to supervise the filing of documents in the record and to carry out all other duties assigned to him under this subpart.

(2) All material required to be included in the record shall be added to the record as soon as feasible after its receipt by EPA. All material in the record shall be appropriately indexed. The Hearing Clerk shall make appropriate arrangements to allow members of the public to copy all non-confidential record materials during normal EPA business hours.

(3) Confidential record material shall be indexed under (2). Confidential record material shall, however, be physically maintained in a separate location from public record material.

(4) Confidential record material shall consist of the following:

(i) Any material submitted pursuant to § 57.802 for which a proper claim of

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confidentiality has been made under section 114(c) of the Act and 40 CFR Part 2; and

(ii) The Staff Computational Analysis prepared under § 57.803.

(b) *Record for issuing tentative determination.* The administrative record for issuing the tentative determination required by § 57.803 shall consist of the material submitted under § 57.802 and any additional materials supporting the tentative determination.

(c) *Record for acting on requests for cross-examination.* The administrative record for acting on requests for cross-examination under § 57.808 shall consist of the record for issuing the tentative determination, all comments timely submitted under §§ 57.803(e)(4) and 57.805, the transcript of the hearing, and any additional material timely submitted under § 57.807(d).

(d) *Record for preparation of recommended decision.* The administrative record for preparation of the recommended decision required by § 57.811 shall consist of the record for acting on requests for cross-examination, the transcript of any supplementary hearing held under § 57.808(c), any materials timely submitted in lieu of or in addition to cross-examination under § 57.808(d), and all briefs, proposed findings of fact and proposed recommendations timely submitted under § 57.810.

(e) *Record for issuance of final decision.* (1) Where no hearing has been held, the administrative record for issuance of the Administrator's final decision shall consist of the record for issuing the tentative determination, any comments timely submitted under § 57.803(e)(4), any briefs or reply briefs timely submitted under § 57.812(a) through (c), and the transcript of any oral argument granted under § 57.812(d).

(2) Where a hearing has been held, the administrative record for issuance of the Administrator's final decision shall consist of the record for preparation of the recommended decision, any briefs or reply briefs submitted under § 57.812(a) through (c), and the transcript of any oral argument granted under § 57.812(d).

§ 57.815 State notification.

The Administrator shall give notice of the final decision in writing to the air pollution control agency of the State in which the smelter is located.

§ 57.816 Effect of Administrator's findings.

No waiver of the interim requirement for the use of constant controls shall be granted by the Administrator or a State unless the Administrator or a State first takes into account the Administrator's report, findings, and recommendations as to whether the use of constant controls would be so costly as to necessitate permanent or prolonged temporary cessations of operation of the shelter.

[45 FR 85015, Dec. 24, 1980]

Subpart J—New Mexico

§ 57.1000 Nonferrous Smelter Order for Chino Mines Company.

(a) Pursuant to the Order Issued March 20, 1981 by the New Mexico Environmental Improvement Board and as amended October 9, 1981 in the matter of the application of Chino Mines Company for a Primary Nonferrous Smelter Order, the following requirements constitute the elements of the NSO. The NSO is not effective beyond January 1, 1983.

(b)(1) Chino is not required to comply with the provisions of the Air Quality Control Regulation ("AQC Reg.") 652.A.1 *Non-Ferrous Smelter-Sulfur,* during such period as this regulation is in effect.

(2) During the effective period of this regulation, all converter off-gases generated by Chino shall be treated by an acid plant except as provided by paragraph 5 of this regulation. Chino shall not permit, cause, suffer or allow sulfur emissions to the atmosphere in excess of forty (40) pounds of sulfur for every one hundred pounds of sulfur fed to the smelter, calendar quarterly average.

(3) Except as provided by paragraph 5 of this regulation, the SO_2 in the acid plant tailgas shall not exceed 0.065% by volume, 12-hour running average as measured by the continu-

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ous monitoring equipment provided for in paragraph 7 of this Regulation. Chino may not use dilution air to meet this limitation.

(4) Except as provided by paragraph (b)(5) of this regulation:

(i) reverberatory stack SO_2 emissions from the smelter shall not exceed 29,592 pounds per hour, daily average, as measured by the continuous monitoring equipment provided for in paragraph (b)(7) of this regulation; and

(ii) fugitive SO_2 emissions from the smelter shall not exceed 6,350 pounds per hour, calendar quarterly average, to be measured by (A) calculating the total amount of input sulfur for each quarter expressed as SO_2 (B) subtracting the amount of SO_2 captured as sulfuric acid during that period, the amount of SO_2 emitted from the acid plant tailgas and reverberatory stacks, and the amount of sulfur in the slag produced during that period expressed as SO_2, and (C) then dividing the result by the number of hours in the quarter.

(5) Bypassing of the acid plant or emissions in excess of those set forth in paragraphs (3) and (4) above shall constitute violation of this regulation, unless such emissions result from (i) equipment malfunction; (ii) the unavoidable startup and shutdown of process and air pollution control equipment.

(6) Chino shall report excess emissions to the Division in accordance with 40 CFR 57.304. The Division shall promptly transmit appropriate copies of said reports to the Board. To the extent that AQC Reg. 801 requires information which is identical to that required by 40 CFR 57.304, the Division shall promptly transmit appropriate copies of said reports to the Board. To the extent that AQC Reg. 801 requires information which is identical to that required by 40 CFR 57.304, compliance with AQC Reg. 801 shall be deemed compliance with this paragraph.

(7) Pursuant to the provisions of 40 CFR 57.305 and 57.404, Chino shall: (i) upon the effective date of this regulation, begin continuous monitoring to measure SO_2 emissions in the acid plant tailgas and reverberatory furnace process off-gas, and (ii) by July 1, 1981, begin continuous monitoring of SO_2 emissions in the captured and vented fugitive gases from the reverberatory furnace and gases bypassed around the acid plant during conditions specified in paragraph 5 of this regulation. Certification of monitors meeting the performance specification as provided in 40 CFR Part 52, Appendices D and E, shall take place, in the presence of a Division observer within six (6) months of the dates specified above. Chino shall comply with all reporting and recordkeeping requirements contained in 40 CFR 57.305(b) and 57.404 (b) and (c).

(8) Upon the effective date of this Regulation, Chino shall operate its supplementary control system in accordance with the provisions of Chino's Supplementary Control System Operational Manual and 40 CFR 57.402. Certification of monitors meeting the performance specification of 40 CFR Part 53 shall take place, in the presence of a Division observer, within six (6) months of the entry of the Regulation. In addition to the requirements of 40 CFR 57.402, Chino shall:

(i) Provide the Division with the name of the auditor (contractor) performing the quarterly audit. The 3-month primary calibration and quarterly audits shall be performed by different individuals. The audits shall be performed utilizing calibration equipment other than that used in the primary calibration;

(ii) Provide the Division with audit, calibration, and maintenance information upon request;

(iii) Consent to be audited by the Division; and

(iv) Provide the Division with the date of purchase of the instruments, and supporting documentation.

(9) Pursuant to Section 74-2-15.1D NMSA 1978, Chino shall prevent the standards contained in AQC Req. 201, *Ambient Air Quality Standards* ("State Standards") and the National Ambient Air Quality Standards ("NAAQS"), for SO_2 from being exceeded within the smelter's Designated Liability Area ("DLA"), which shall be defined as a circle with a center point at the smelter reverberatory stack and a radius of 7.5 miles and

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shall exclude any company property with no public access lying therein. A violation of the State Standards or NAAQS within the smelter's DLA shall constitute a violation of this Regulation, unless Chino can demonstrate that such violations were caused by conditions excused as violations of this Regulation, as provided in paragraph 5 of this Regulation, and that it had taken all necessary and appropriate actions to avoid and minimize such violations, including the operation of its supplementary control system.

(10) Chino shall conduct an active program to review the design and operation of its supplementary control system as provided in 40 CFR 57.402(f). During the term of this Regulation and as part of the program described above, Chino shall install and operate a minimum of two monitoring stations for SO_2 not tied to the supplementary control system. The sites for the monitors, and a schedule for their installation shall be agreed upon by Chino and the Division. Chino shall submit to the Board, with copies to the Division, quarterly reports of the data obtained detailing the results of this review. Such reports shall be due fifteen (15) days after the end of each calendar quarter. The Division shall, if necessary require Chino to relocate any of the SO_2 monitors and tie them into the supplementary control system. The monitors not tied into the supplementary control system must meet the performance specifications of 40 CFR. part 53. Siting criteria for monitors described in this paragraph shall conform to 40 CFR Part 58, Appendix E. Chino shall submit to the Board, with copies to the Division, the final report required by 40 CFR 57.405(b) no later than three (3) months following the termination of this Regulation.

(11) Chino shall meet the fugitive emission control requirements of 40 CFR 57.501 through 503 through completion of the fugitive emissions control requirements of the Schedule of Compliance Order, issued to Chino pursuant to AQS Reg. 510, *Fugitive Particulate Matter Emissions From Nonferrous Smelter.* Chino shall evaluate the impacts of the control measures required under the Schedule of Compliance Order on fugitive SO_2 and on ambient air quality in the smelter's DLA. Chino shall submit to the Board, with copies to the Division, a report of the data obtained detailing results of the evaluation within six (6) months after the effective date of this Regulation. Chino shall either make the demonstration contemplated by 40 CFR 57.502(a) or shall submit the design and study work plan provided for in that section.

(12) Chino shall conduct the research and development program set forth in its Application. Phase I of that program shall be completed within six (6) months after the effective date of this Regulation. Phase II within eighteen (18) months after the effective date, and Phase III within (30) months after the effective date. Reports summarizing the results of Phase I and II shall be submitted to the Board, with copies to the Division, within one month after the completion of Phase III. Further, Chino shall provide for an independent evaluation of the research and development program pursuant to the provision of 40 CFR 57.604. These reports shall be submitted to the Division and Environmental Protection Agency at least annually and, on any case, upon the completion of significant stages of the program.

(13) At any time during which this Regulation is in effect, the Board may hold a public hearing respecting the availability of technology sufficient to meet AQC Reg. 652. This Regulation shall be terminated if the Board determines, after notice and public hearing, that the conditions upon which this Regulation was based no longer exist. If Chino demonstrates that prompt termination of this Regulation would result in undue hardship, the termination shall become effective at the earliest practicable date on which such undue hardship would not result but in no event later than January 1, 1983.

(14) The following documents are hereby incorporated as part of this Regulation:

(i) Supplementary Control System Operating Manual entitled "Kennecott Minerals Company Chino Mines Division Supplementary Control System Operational Manual";

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(ii) Written Consent for Designated Liability Area signed by I.G. Pickering, Senior Vice President—Operations—Kennecott Minerals Company.

(iii) Written Consent for Research and Development Program signed by I.G. Pickering, Senior Vice-President—Operations—Kennecott Minerals Company; and

(iv) "Proposed Research and Development Program" submitted by Kennecott Minerals Company.

[47 FR 21791, May 20, 1982]

APPENDIX A—PRIMARY NONFERROUS SMELTER ORDER (NSO) APPLICATION

Instructions

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1. *General Instructions*

1.1 *Purpose of the Application*

This application provides financial reporting schedules and the accompanying instructions for EPA's determination of eligibility for a nonferrous smelter order (NSO), and for a waiver of the interim constant controls requirement of an NSO. Although the determination of eligibility for an NSO is prerequisite for the determination of a waiver, Appendix A, as a matter of convenience to applicants, includes both the NSO and waiver tests and reporting schedules.

In order to support an NSO eligibility determination, the applicant must submit operating and financial data as specified by the schedules included in this application. Specific instructions for completing each schedule are provided in subsequent sections of the instructions. In general, applicants must provide:

(a) Annual income statements, balance sheets and supporting data covering the five most recent fiscal years for the smelter for which the NSO is requested.

(b) Forecasts of operating revenues, operating costs, net income from operations and capital investments for the firm's smelter operations subject to this application, on the basis of anticipated smelter operations after installing additional pollution control facilities required to comply with the smelter's SIP emission limitations.

(c) For smelters applying for a waiver of interim constant controls, forecasts of operating revenues, operating costs, and capital investments for the firm's smelter operations prepared on the basis of anticipated smelter operations after installing additional pollution control facilities required to comply with interim constant control requirements.

1.2 *NSO Economic Capability Tests*

EPA will evaluate eligibility for an NSO or for a waiver of the interim constant control requirement by the following tests of an applicant's economic capability to undertake additional pollution control expenditures. The test for NSO eligibility employs a present value approach for determining an applicant's economic capability to implement a system of constant control technology that will achieve full compliance with SIP emission limitations. The tests for the waiver of the interim constant control requirements employ variable costing and discounted cash flow standards for evaluating an applicant's economic capability to implement those requirements. The period of analysis for these tests shall be 1980 through 1986, inclusive or yearly to include a period of two full years following completion and startup of the pollution control system. All references to 1980 to 1986 shall be interpreted accordingly and all additional years shall be reported.

1.2.1 *Net Income Test.* Each applicant must establish that firm is not economically capable of implementing a system of pro-

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duction and/or constant control technology that will achieve full compliance with SIP emission limitation standards.

Inadequate economic capability is defined in this test as an inability to undertake the required installation of new, or modification to existing production and/or constant control facilities without reducing the present value of the smelters net income and terminal value below the smelter's current salvage value under an orderly plan of liquidation.

1.2.2 *Temporary Waiver from Interim Controls.* Applicants that do not have an existing constant controls system may apply for a waiver from requirements for the interim controls. Applicants will be eligible for a temporary waiver from the interim constant control requirement if they can establish pursuant to the procedures in this application that the imposition of such control requirements would economically necessitate closure of the smelter facility for a period of one year or longer. The economic justification for a non-permanent closure under this temporary waiver test is defined as a situation in which the smelter's projected operating revenues for one or more years within the forecast period are inadequate to cover variable operating costs anticipated after installing the required interim control technology. Temporary waivers will be granted for only the period of time over which applicants can establish an inability by the firm to cover its variable operating costs. Interim control waiver requests based on the smelter's projected inability to earn adequate income after installation of interim pollution control equipment will be subject to the permanent waiver test.

1.2.3 *Permanent Waiver from Interim Controls.* Applicants without an existing constant controls system will be eligible for a full waiver from the interim use of such controls if they can establish pursuant to the procedure in this application that an imposition of interim control requirements would necessitate permanent closure of the smelter. Economic justification for a permanent closure is defined as a situation in which the present value of future cash flows anticipated from the smelter after installing the required interim control technology are less than the smelter's current salvage value under an orderly plan of liquidation.

1.2.4 *EPA Contact for NSO Inquiries.* Inquiries concerning this portion of the requirements for NSO application should be addressed to David M. Rochlin, Environmental Protection Agency, EN 341, 401 M Street SW., Washington, D.C. 20460.

1.2.5 *Certification.* The NSO Certification Statement must be signed by an authorized officer of the applicant firm.

1.3 *Confidentiality*

Applicants may request that information contained in this application be treated as confidential. Agency regulations concerning claims of confidentiality of business information are contained in 40 CFR Part 2, Subpart B (41 FR 36902 *et seq.*, September 1, 1976, as amended by 43 FR 39997 *et seq.*, September 8, 1978). The regulations provide that a business may, if it desires, assert a business confidentiality claim covering part or all of the information furnished to EPA. The claim must be made at the same time the applicable information is submitted. The manner of asserting such claims is specified in 40 CFR 2.203(b). Information covered by such a claim will be handled by the Agency in accordance with procedures set forth in the Subpart B regulations. No information will be disclosed by EPA as to which a claim of confidentiality has been made except to the extent of and in accordance with 40 CFR Part 2, Subpart B. However, if no claim of confidentiality is made when information is furnished to EPA, the information may be made available to the public without notice to the business.

1.4 *Data Entry*

1.4.1 *Rounding.* All amounts (including both dollar values and physical units) reported in the schedules and exhibits accompanying this application must be rounded to the nearest thousand and expressed in thousands of dollars or units unless otherwise indicated in the instructions.

1.4.2 *Estimates.* Where an applicant's records cannot produce the specific data required by this application, the use of estimates will be allowed if a meaningful estimate can be made without significant distortion of the reported results. Data estimates must be supported by attaching on a separate sheet of paper as a part of Exhibit B an explanation identifying where such estimates are used and showing explicitly how the estimates were made.

1.4.3 *Missing Data.* Applicants must provide, where applicable, all operating and financial data requested by this application. Only substantially complete applications can be accepted for processing by the Agency. Questions concerning data entries for which information is not provided by, or cannot reasonably be estimated from, the applicant's existing accounting records should be addressed to the EPA Contact for NSO Inquiries.

1.5 *Use of Exhibits*

In addition to data required by the schedules included in this application, the following information must be attached as exhibits.

1.5.1 *Exhibit A.* Background information on the firm's organizational structure and its associated accounting and financial reporting systems for primary nonferrous activities. This information should include, where applicable, the firm's:

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(a) Operating association with and ownership control in consolidated subsidiaries, unconsolidated subsidiaries, joint ventures and other affiliated companies.

(b) Organizational subdivision of its primary nonferrous activities into profit centers, cost centers and/or related financial reporting entities employed to control the operation of its mines, concentrators, smelters, refineries and other associated facilities.

(c) Material and product flows among the smelter subject to this NSO application, other integrated facilities and its affiliated suppliers and/or customers. In the case of integrated facilities, applicants should provide process flow diagrams depicting the operating interrelationships among its mines, concentrators, smelters, refineries and other integrated facilities. For both integrated and nonintegrated facilities, applicants also should describe the proportion contributed to its primary nonferrous activities by material purchases from and product sales to affiliated suppliers and customers.

(d) Annual operating capacity over the five most recent fiscal years for the smelter subject to this application and the firm's other nonferrous facilities. Operating capacity should be defined in terms of the total quantity of throughput that could have been processed with the available facilities after giving appropriate allowance to normal downtime requirements for maintenance and repairs. Operating capacity data also should consider both capacity balancing requirements among processing steps and annual processing yield rates attainable for each facility.

(e) Weighted average analysis of concentrates processed and tonnage produced annually over each of the five most recent fiscal years by the smelter subject to this application. The operators of integrated facilities also should provide annual data over the five-year period on both the sources of and a weighted average analysis of concentrates and ores processed and tonnage produced by individual profit centers.

(f) Accounting system and policies for recording investment expenditures, operating revenues, operating costs and income taxes associated with its primary nonferrous activities. Applicants also should provide a complete description of allocation techniques employed for assigning investments, revenues, costs and taxes to individual profit, cost or departmental centers for which costs are accumulated. Applicants should further indicate the relationship of cost and/or departmental accounting entities to the firm's established profit centers.

(g) Annual and five-year operating and capital expenditure plans (or budgets) by individual nonferrous profit center. These documents should include previous plans prepared for the five preceding fiscal years as well as the current one-year and five-year operating and capital expenditure plans. At least the current one-year and five-year plans should provide a specific breakdown of investment expenditures and operating costs associated with the operation and maintenance of each profit center's existing and proposed pollution control facilities.

1.5.2 *Exhibit B.* Supplemental description and explanation of items appearing in the financial reporting schedules.

1.5.3 *Exhibit C.* Financial data documentation. Applicants must document annual balance sheet, income statement and supporting data reported for the firm's preceding five fiscal years or for that portion of the past five years during which the firm engaged in smelter operations. This documentation should be provided by attaching to the application:

(a) SEC 10-K reports filed by the parent corporation and its unconsolidated subsidiaries for each of the preceding five fiscal years.

(b) Certified financial statements prepared (a) on a consolidated basis for the parent corporation and its consolidated subsidiaries and (b) for the firm's unconsolidated subsidiaries and affiliates. This requirement may be omitted for those years in which SEC 10-K reports have been attached to this Exhibit.

(c) Business Segment Information reports filed with the Securities and Exchange Commission by the firm and its unconsolidated subsidiaries for each of the preceding five years (as available).

2. *NSO Financial Reporting Overview*

2.1 *Revenue and Cost Assignment.* The amounts assigned to operations of the smelter subject to this NSO application should include (1) revenues and costs directly attributable to the smelter's operating activities and (2) indirect operating costs shared with other segments of the firm to the extent that a specific causal and beneficial relationship can be identified for the allocation of such costs to the smelter. Do not allocate revenues and costs associated with central administrative activities for which specific causal and beneficial relationships to the activities of the smelter cannot be established. Nonallocable items include, but are not restricted to, amounts such as dividend and interest income on centrally administered portfolio investments, central corporate administrative office expenses and interest on long-term debt financing arrangements. Provide a detailed explanation of amounts classified as nontraceable on a separate schedule and attach as part of Exhibit B.

2.2 *Transfer Prices on Affilitated Party Transactions.* Certain transactions by the smelter subject to an NSO application may reflect sales to or purchases from "affiliated" customers or suppliers with whom the

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smelter has a common bond of ownership and/or managerial control. In preparing this application, affiliated party transactions shall be defined as transactions with any entity that the firm, or its owners, controls directly or indirectly either through an ownership of 10 percent or more of the entity's voting interests or through an exercise of managerial responsibility. Applicants must attach as part of Exhibit B supporting schedules explaining the pricing policies established on affilitated party transactions incorporated in the financial reporting schedules.

Prices on inter-segment material and product transfers within a firm, or on external purchases from and sales to other affiliated suppliers and customers, may differ from the prices on comparable transactions with unaffiliated suppliers and customers. In this event, applicants also should present in the Exhibit B supporting schedules and incorporate in the NSO financial reporting schedules appropriate adjustments for restating affiliated party transactions. Affiliated party transactions should be restated at either (a) equivalent prices on comparable transactions with unaffiliated parties if such price quotations can be obtained or (b) prices that provide the selling entity with a normal profit margin above its cost of sales if a meaningful comparison with unaffiliated transaction prices cannot be established. A "normal" profit margin should be defined as the gross operating profit per dollar of operating revenue that will provide an after-tax rate of return on permanent capital (long-term assets less current liabilities) of no more than eight percent.

2.3 *Forecasting Requirements.* Applicants must provide the Agency with financial forecasts (Schedules C.1 and C.2) covering the period from fiscal years 1980 through 1986 or yearly to include a period of two full years following completion and startup of the pollution control system. All references to 1980 to 1986 shall be interpreted accordingly and all additional years shall be reported reflecting applicant expectations about future smelter operations if additional constant controls are required to comply with SIP sulfur dioxide emission limitations.

Applicants requesting either a temporary or permanent waiver from interim constant control requirements also must provide an additional set of financial forecasts (Schedule D.1 and D.2) reflecting anticipated smelter operations with the installation of such controls.

It is recognized that some line items may be the same under both cases. On the other hand, production interruptions or curtailments due to the installation of additional pollution control facilities may require adjustments to certain revenue and cost estimates in the respective control cases. The installation of additional pollution control facilities that involve process changes in the smelter's operations also may require specific forecasts by applicants of associated impacts on incremental operating revenues and costs.

Applicants should make their financial forecasts in terms of nominal dollar estimates. Forecasts of selected parameters provided by EPA will furnish guidelines to an applicant in preparing part of the required cost and revenue estimates. In particular, refined copper, zinc and lead price indices provided in nominal-dollar terms should be used directly by the applicant as given—i.e., the stipulated price estimates should not be inflated. In all cases applicants should disclose the index applied to their revenue and cost forecasts.

2.4 *EPA Furnished Forecast Data:* In making projections of the period 1980 through 1986, applicants should, except as noted below, use the following indices provided by EPA. These indices are available in the rulemaking docket, or from the INFORMATION CONTACT noted in the FEDERAL REGISTER. The indices are:

(a) Aggregate industry production of copper, lead and zinc.

(b) Average capacity utilization factors for primary nonferrous metal producers.

(c) Refined prices for copper, lead and zinc.

(d) Wage indices for manufacturing labor. These indices are to be used only for estimating wage increases after the expiration of the applicant's current labor agreements.*

(e) Gross National Product price deflator.*

(f) Weighted average cost of capital for nonferrous metal producers. The applicant may, in lieu of this estimate, use its own weighted cost of capital estimate, provided that it is generated according to accepted financial theory and is fully documented as part of Exhibit B.

(g) Energy Price Indices. The applicant should use the index in Table 3 * for the appropriate product and year to calculate the rate of price increase for each energy product for the period following the expiration of existing contracts. Where contracts expire during the calendar year, prices should be calculated by rounding to the nearest quarter and interpolating to the next calendar year if necessary. The applicant may use instead any reasonable projection made by its own supplier of that energy

* This information appears in "Energy Price Indices, Manufacturing Wages Indices, and Gross National Product Deflators, 1980-1986," an EPA report available in the docket or from the INFORMATION CONTACT listed in the FEDERAL REGISTER notice.

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product, providing the projection is fully documented as part of Exhibit B. EPA or supplier indices are to be used by the applicant only for periods after the expiration of current contracts.

2.5 *Applicant Generated Forecasts:* Within the specified limitations, applicants may employ any reasonable method of forecasting by-product, co-product and other prices not provided by the Agency. The method selected should be explained and unit prices or costs provided where applicable. The forecast elements should be compatible with an applicant's historical cost and revenue elements to permit direct comparisons of historical and forecasted data. Applicants should attach as part of Exhibit B appropriate schedules explaining variances between forecasted and historical unit costs for the smelter.

An acceptable method of forecasting by-product (e.g., gold and silver) prices would be to (a) compute an average of the 1978 constant-dollar equivalents to a by-product's 1973-1979 prices and (b) inflate the average price by the forecasted general rate of inflation for each successive year over the 1980-1986 forecast period. Similarly, concentrate prices could be estimated by applying forecasts of the appropriate refined price index to typical contractual terms indicated for 1979 purchases from unaffiliated suppliers.

To the maximum extent practicable, by-product, co-product and (when applicable) unaffiliated concentrate prices should be stated at market prices adjusted to f.o.b. smelter. Adjustments to these pricing bases should be made to reflect differences in grades and types of production. All adjustments should be consistent with expected sales, grades and types of concentrate processes. Applicants should attach as part of Exhibit B schedules describing and explaining the methods used to forecast these revenue and cost items and the adjustments required for these revenue and cost forecasts.

Applicants should explain fully any changes from the historical data that are required to forecast labor productivity, ore/concentrate grade and composition, materials and energy consumption per unit of output, yield rates and other physical input/output relationships.

Existing contractual terms should be used in forecasting those sales or input costs or prices to which the applicant is committed by contracts. The use of contract-dictated prices should be disclosed and supported by attaching as part of Exhibit B the terms and duration of labor and other supplier arrangements.

Cost of compliance estimates need not be to the accuracy of final design/bid estimates; feasibility grade estimates will be acceptable. Updated cost of compliance estimates used in internal five year plans or specially prepared internal estimates of costs of compliance will generally be satisfactory.

2.6 *Depreciation.* Depreciation refers to that used for Federal Income Tax purposes.

Constant Controls Forecast Summary—Schedule A.1

General

All applicants must complete this schedule and its supporting schedules under the conditions where the applicant would undertake sufficient additional investment in pollution control facilities to achieve full compliance with Agency emission limitation standards.

Line 01—Net Income from Operations. Enter for each year from 1980 through 1986 the amount reported in Schedule C.1, Line 25.

Line 02—Constant Controls Capital Investment. Enter the estimated capital outlays for constant controls in the years which outlays would be made. These values shall correspond to the investment estimates shown in the supporting schedules for Line 18 of Schedule C.1. Changes in working capital investment due to investment constant controls facilities may be added to the capital investment estimates shown in Schedule C.1.

Line 03—Sustaining Capital. Enter for each year from 1980 through 1986, the amounts reported on Schedule C.2., Line 07.

Line 04—Total. Enter the sum of Line 02 and Line 03 for each year.

Line 05—Adjusted Cash Flow Projections. Enter for each year from 1980 through 1986 the difference between amounts reported on Line 01 and 04.

Line 06—Discount Factors. Enter the discount factor for each year from 1980 through 1986 corresponding to the weighted cost of capital as furnished by EPA or estimated by the applicant pursuant to the instructions under section 2.5.

Line 07—Present Value of Future Cash Flows. Enter for each year from 1980 through 1986 the product of Line 05 times Line 06.

Line 08—Terminal Value. Enter under the total column, the estimated terminal value of the smelter. This shall be computed by capitalizing the forecasted net income (Schedule C.1, Line 25) for operations in 1986 by the historical cost of capital as furnished by EPA. Specifically, multiply net income for the last year-by-year forecast by 9.2.

Line 09—Discount Factor. Enter the appropriate discount factor corresponding to the weighted cost of capital as furnished by EPA or estimated by the Applicant pursuant to instructions under Section 2.5.

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Line 10—Present Value of Terminal Salvage Value. Enter the product of Line 08 times Line 09.

Line 11—Present Value of Future Cash Flows. Enter the sum of amounts previously reported on Line 07 for 1980 through 1986.

Line 12—Total Present Value. Enter the sum of Line 10 plus Line 11.

Line 13—Current Salvage Value. Enter the amount reported in Schedule B.2.a, Line 17 if the value is greater than zero. If the value is zero or less enter zero.

Line 14—Net Present Value. Enter the difference between Line 12 and 13. Applicants reporting a negative net present value will be eligible for a waiver from full compliance with constant control standards for SIP sulfur dioxide emission limitations. Applicants that do not have an existing system of constant control technology also must complete Schedule A.2 and Schedule D.1 and D.2 to determine their eligibility for a temporary or permanent waiver from interim control requirements.

Interim Controls Forecast Summary—Schedule A.2

General

Applicants that do not have an existing system of constant control technology must complete this schedule and its supporting schedules if they want to request a waiver from interim control requirements.

Line 01—Gross Operating Profit. Enter for each year from 1980 through 1986, the amount reported in Schedule D.1, Line 14. Applicants will be eligible for a temporary waiver from the interim development of constant control technology for sulfur dioxide emissions if the reported gross operating profit is a negative value for one or more years during the 1980 through 1986 forecast period. Applicants also should complete parts B and C of Schedule A.2 to determine eligibility for a permanent waiver from interim-control requirements.

Line 02—Net Income from Operations. Enter for each year from 1980 through 1986 the amount reported in Schedule D.1, Line 25.

Lines 03 and 04—Depreciation and Amortization. Enter for each year from 1980-1986 the amounts reported in Schedule D.1, Lines 18 and 19.

Line 05—Operating Cash Flow. Enter for each year from 1980-1986 the total of amounts reported on Lines 02 through 04.

Line 06—Interim Controls Capital Investment. Enter the estimated capital outlays for interim controls for the years during which outlays would be made. These values shall correspond to the investment estimates shown in the supporting schedules for Line 18 of Schedule D.1. Changes in working capital investment due to investment in interim controls facilities may be added to the capital investment estimates shown in Schedule D.1.

Line 07—Sustaining Capital. Enter for each year from 1980-1986, the amounts reported in Schedule D.2, Line 07.

Line 08—Total. Enter the sum of Line 06 and Line 07 for each year.

Line 09—Net Cash Flow Projections. Enter for each year from 1980 through 1986 the difference between the amounts reported on Line 05 and 08.

Line 10—Discount Factors. Enter the discount factor for each year from 1980-1986 corresponding to the weighted cost of capital as furnished by EPA or estimated by the applicant pursuant to the instructions under Section 2.5.

Line 11—Present Value of Future Cash Flows. Enter for each year from 1980-1986, the product of Line 09 times Line 10.

Line 12—Terminal Value. Enter under the Total column, the estimated terminal value of the smelter. This shall be computed by capitalizing the forecasted net income plus after-tax interest expense on long-term debt (Schedule D.1, Line 23) from operations for 1986 by the historical cost of capital as furnished by EPA. Specifically, multiply net income plus after-tax interest expense on long-term debt for the last year of the year by forecast by 10.6.

Line 13—Discount Factor. Enter the appropriate discount factor corresponding to the weighted cost of capital as furnished by EPA or estimated by the applicant pursuant to instructions under Section 2.5.

Line 14—Present Value of Terminal Salvage Value. Enter the product of Line 12 times Line 13.

Line 15—Present-Value of Future Cash Flows. Enter the sum of amounts previously reported on Line 11 for 1980-1986.

Line 16—Total Present Value. Enter the sum of Line 14 plus Line 15.

Line 17—Current Salvage Value. Enter the amount reported in Schedule B.2.a, Line 17, if the value is greater than zero. If the value is zero or less, enter zero.

Line 18—Net Present Value. Enter the difference between amounts reported on Lines 16 and 17. Applicants reporting a negative net present value will be eligible for a permanent waiver from interim use of a constant control system for sulfur dioxide emissions.

Historical Profit and Loss Summary—Schedule B.1

General

Report annual revenues, costs and income taxes assignable to operation of the smelter subject to this NSO application. Assignable revenues and costs should include only the results of transactions either (1) directly associated with smelter operations or (2) for

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which the applicant can establish a causal and beneficial relationship with smelter operations pursuant to instructions in Section 2.1. The annual data requested in this schedule should be reported for each of the five fiscal years immediately preceding the year in which this application is filed or for that portion of the five-year period during which the firm engaged in smelter operations.

Line 01—Primary Metal Sales. Enter for each fiscal year the amount reported in Schedule B.1.a., Line 40.

Line 02—Co-Product and By-Product Sales. Report annual revenues, net of returns and allowances, derived from smelter sales and/or transfers of co-products and by-products to both unaffiliated and affiliated customers. Attach as part of Exhibit B a supporting schedule for each major co-product and by-product component of smelter revenues. Segregate the revenues reported by major co-product and by-product components into their unaffiliated customer and affiliated customer elements. Report for each component's unaffiliated and affiliated customer revenue elements the (1) average grade of product sold, (2) actual quantity sold, (3) average price per unit and (4) total smelter revenues. Also show for each product line any adjustments required to restate transfer prices and explain the basis for such adjustments. Refer to the NSO Financial Reporting Overview Section 2.2 on "Transfer Prices on Affiliated Party Transactions" for instructions on the restatement of affiliated customer revenues.

Line 03—Tolling Service Revenues. Enter for each year the amount reported in Schedule B.1.a., Line 53.

Line 04—Other Operating Revenues. Report annual revenues directly associated with smelter operations that have not previously been reported on Lines 01 through 03. Attach as part of Exhibit B a schedule showing the types and amounts of sales reported as other operating revenue. The following non-operating revenue and income items should *not* be included as other operating revenue or as a part of revenues reported on Line 01 through 03.

- Royalties, licensing fees and other income from intangibles
- Interest and dividend income on portfolio investments
- Equity in income (loss) of unconsolidated subsidiaries and affiliates
- Gain (loss) from discontinued operations and disposal of property
- Minority interest adjustment to consolidated subsidiary income.
- Extraordinary items.

Line 05—Total Operating Revenue. Enter the total of amounts reported on Lines 01 through 04 for each year.

Line 06—Concentrates Processed. Report the cost of concentrates processed and sold or transferred to unaffiliated and affiliated customers from Schedule B.1.b, Line 13. Concentrates purchased from unaffiliated suppliers should be valued at the actual prices paid. Concentrates purchased from affiliated suppliers should be valued at or, if necessary, restated to equivalent prices quoted by unaffiliated suppliers. If prices used to report revenues are c.i.f. and concentrate costs are f.o.b. smelter, all transportation charges paid on the seller's or buyer's account should be excluded from smelter expense. Attach as part of Exhibit B supporting schedules showing the:

- Annual value of concentrate purchases classified according to purchases from unaffiliated and affiliated suppliers.
- Cost of sales adjustments to concentrate purchases for net annual additions to or withdrawals from concentrate inventories, freight-in on concentrate purchases and inventory spoilage.
- Impact on cost of sales for restating, where applicable, the cost of concentrate purchases from affiliated suppliers to the equivalent prices paid to unaffiliated suppliers.
- Volumes, grades and net prices of concentrate purchases from unaffiliated and affiliated suppliers by type of concentrate purchased.
- Volumes, grades and net prices associated with toll concentrates processed by type of concentrate.

Line 07—Other Materials Costs. Report annual costs incurred for flux, refractories, coke and other materials used by the smelter in its processing of concentrates. Materials purchased from unaffiliated suppliers should be valued at the actual prices paid after adjustment for transportation costs incurred. Materials purchased from affiliated suppliers should be valued at or, if necessary, restated to equivalent prices quoted by unaffiliated suppliers. Include in Exhibit B supporting schedules showing the:

- Annual value of material purchases classified according to purchases from unaffiliated and affiliated suppliers.
- Cost of sales adjustments to material purchases for net annual additions to or withdrawals from material inventories, freight costs on material purchases and inventory loss.
- Impact on cost of sales for restating, where applicable, the costs of material purchases from affiliated suppliers to equivalent prices paid to unaffiliated suppliers.
- Classification of other material costs by major cost factors for each cost component that exceeds 20 percent of any line item in the cost of sales schedule.

Line 08—Production Labor Costs. Report in each column total direct labor costs incurred by the smelter for processing purchased and toll concentrates, Schedule

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B.1.b, Line 18. Include in Exhibit B supporting schedules showing the:

- Manhours and wage rates for major labor classifications.
- Potential impact on wage rates of provision in the smelter's current labor contracts.
- Explanation of major variances observed in direct labor costs over the five-year period as a result of factors such as strikes or new labor contracts.

Line 09—Energy Costs. Enter the totals for the five fiscal years reported in Schedule B.1.b, Line 34.

Line 10—Pollution Control Costs. Report in each column expenses incurred for operating and maintaining pollution control facilities. All by-product credits associated with pollution control facility operations should be eliminated and reported on Line 02. Depreciation and amortization charges against the smelter's pollution control facilities should be reported separately on Line 18. Attach as part of Exhibit B supporting schedules showing the:

- Major pollution control cost elements with their values classified according to direct and indirect cost factors.
- Techniques used to allocate indirect pollution control costs to major cost pools.

Line 11—Production Overhead. Report the total costs for indirect labor, indirect materials and other production overhead costs associated with the smelter for each year. Attach as part of Exhibit B a schedule showing annual overhead costs by major cost components associated with the smelter's operations. For each cost component, where appropriate, identify the quantity and unit price element of overhead costs.

Line 12—Other Production Costs. Report annual smelter overhead and other production costs not previously reported on Lines 06 through 11. By-product credits, if any, should be eliminated and reported on Line 02 as operating revenues. Attach as part of Exhibit B supporting schedules showing the:

- Major cost elements classified according to direct and indirect production costs.
- Disaggregation of major overhead cost components into their fixed and variable cost elements.
- Allocation techniques used in assigning indirect overhead costs to the major cost components.
- Elements of overhead costs represented by purchases from affiliated suppliers and adjustments, if any, required to restate these costs on the basis of equivalent prices paid to unaffiliated suppliers.

Line 13—Total Cost of Sales. Enter the total of amounts reported on Lines 06 through 12 for each year.

Line 14—Gross Operating Profit. Enter the amount reported on Line 05 minus the amount reported on Line 13 for each year.

Line 15—Selling, General & Administrative (SG&A) Expenses. Report SG&A expenses attributable to the smelter's annual operating activities. Exclude those operating costs to be reported separately on Lines 16 through 21 and those costs for which causal and beneficial relationships to the smelter cannot be established. Attach as part of Exhibit B supporting schedules (1) segregating SG&A expenses by major expense components, (2) classifying the major expense components according to those costs incurred directly by smelter operations and costs allocated to the smelter from indirect cost pools and (3) explaining the basis used for indirect cost allocations.

Line 16—Taxes, Other Than Income Tax. Report all taxes (exclusive of Federal, state, local and foreign income taxes) assignable to the smelters operations. Attach as part of Exhibit B, a schedule that (1) segregates these operating taxes by major component, (2) classifies each component according to direct and indirect cost elements, and (3) explains the basis used for indirect cost allocations.

Line 17—Exploration and Research Costs. Report exploration and research costs (exclusive of capitalized costs reported in Schedule B.2) that are assignable to the smelter's annual operations. Attach as part of Exhibit B a schedule (1) segregating exploration and research costs by major expense components, (2) classifying each expense component according to direct and indirect cost elements and (3) explaining the basis used for indirect cost allocations.

Line 18—Pollution Control Depreciation and Amortization. Report annual depreciation and amortization charges attributable to the smelter's investment in pollution control facilities and equipment. Reported charges should be computed in accordance with depreciation and amortization methods adopted for tax reporting purposes by the firm. Attach as part of Exhibit B a schedule segregating the smelter's pollution control and nonpollution control facility investments into major depreciable asset components. Describe for each asset component the (1) depreciation method adopted for tax reporting purposes, (2) annual depreciation and amortization charges by applicable fiscal year, (3) classification of annual charges into direct and indirect cost elements and (4) basis used for indirect cost allocations.

Line 19—Other Facility Depreciation and Amortization. Report annual depreciation and amortization charges (exclusive of charges reported on Line 18) assignable to the smelter's operations. Refer to Line 18 instructions for additional reporting requirements.

Line 20—Interest on Short-Term Debt. Report interest expense and associated fi-

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nancial charges for each year on current liabilities in accordance with the assignment instructions in Section 2.1. Do not include interest on the portion of long-term debt due within the current year for each reporting period.

Line 21—Miscellaneous Operating Expenses. Report any additional expenses assignable to the smelter's annual operations. Attach as part of Exhibit B a schedule (1) segregating these additional expenses into major expense components, (2) classifying each expense component according to costs incurred directly by the smelter and costs allocated to the smelter from indirect cost pools and (3) explaining the basis used for indirect cost allocations.

Line 22—Total Other Operating Expenses. Enter the total of amounts reported on Lines 15 through 21 for each year.

Line 23—Income from Operations. Enter the amount reported on Line 14 minus the amount reported on Line 22 for each year.

Line 24—Gain/(Loss) from Disposition of Property. Report net gains or losses recognized during each year from disposition of property, plant and equipment. Report such gains or losses in accordance with the firm's normal practice for certified financial statement reporting. If such gains or losses are not significant and are classified otherwise, no reclassification need be made. A note to this effect must be included in Exhibit B.

Line 25—Miscellaneous Income and Expenses. Report minority interest in income, foreign currency translation effects, and other non-operating income and expenses directly assignable to the smelter and not recognized elsewhere on this schedule. Report such items in accordance with the accounting methods used for certified financial reporting purposes.

Line 26—Total Other Income and Expenses. Enter the algebraic sum of amounts reported on Lines 24 through 25 for each year.

Line 27—Net Taxable Income. Enter the amount reported on Line 23 minus the amount reported on Line 26 for each year.

Supplemental Historical Revenue Data—Schedule B.1.a

General

Report annual product sales and associated operating revenues, net of returns and allowances, from smelter sales and/or transfers of copper, lead and zinc products and tolling services to both unaffiliated and affiliated customers. Revenues from affiliated customer sales should be stated or, if necessary, restated at prices equivalent to those received on comparable sales to unaffiliated customers. Refer to the NSO Financial Reporting Overview discussion of "Transfer Prices on Affiliated Party Transactions" for instructions on the restatement of affiliated customer revenues.

Lines 01, 14 and 27—Primary Nonferrous Product Sales. Report in thousands of tons the total quantity of copper, lead and zinc products sold in each respective fiscal year.

Lines 02, 15 and 28—Unaffiliated Customer Sales. Report in thousands of tons the respective quantities of copper, lead and zinc product sales to unaffiliated customers during each fiscal year.

Lines, 03, 16 and 29—Unaffiliated Customer Revenues. Report in thousands of dollars the total operating revenues derived from smelter sales of copper, lead and zinc to unaffiliated customers during each fiscal year.

Lines 04, 17 and 30—Unaffiliated Customer Prices. Report the average unit price, computed as operating revenues reported on Lines 03, 16 and 29 divided by the quantities reported on Lines 02, 15 and 28, respectively, received on smelter sales of copper, lead and zinc to unaffiliated customers during each fiscal year.

Lines 05, 18 and 31—Average Product Quality Grade. Report the average quality rating assigned to copper, lead and zinc products purchased by the smelter's unaffiliated customers.

Lines 06, 19 and 32—Affiliated Customer Sales. Report in thousands of tons the respective quantities of copper, lead and zinc product sales to affiliated customers during each fiscal year.

Lines 07, 20 and 33—Affiliated Customer Revenues. Report in thousands of dollars the total operating revenues derived from smelter sales of copper, lead and zinc to affiliated customers during each fiscal year.

Lines 08, 21 and 34—Affiliated Customer Prices. Report the average unit price, computed as operating revenues reported on Lines 07, 20 and 33 divided by the quantities reported on Lines 06, 19 and 32, respectively, received on smelter sales of copper, lead and zinc to affiliated customers during each fiscal year.

Lines 09, 22 and 35—Average Product Quality Grade. Report the average quality rating assigned to copper, lead and zinc products purchased by the smelter's affiliated customers.

Lines 10, 23 and 36—Total Primary Product Revenues. Report total operating revenues derived from the smelter's sales to unaffiliated and affiliated customers of copper (Lines 03 + 07), lead (Lines 16 + 20) and zinc (Lines 29 + 33) during each fiscal year.

Lines 11, 24 and 37—Transfer Price Adjustments. Report operating revenue adjustments required to equate affiliated customer transfer prices with unaffiliated customer market prices on smelter sales of copper, lead and zinc during each fiscal year. Attach as part of Exhibit B an explanation of the

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method used for restating transfer prices where such adjustments are necessary.

Lines 12, 25 and 38—Other Revenue Adjustments. Report sales returns and allowances and other adjustments applicable to the smelter's revenues derived from copper, lead and zinc product sales. Attach as part of Exhibit B a schedule reporting the types and amounts of such adjustments.

Lines 13, 26 and 39—Adjusted Product Revenues. Enter the algebraic sums of Lines 10 through 12 for adjusted copper sales (Line 13), Lines 23 through 25 for adjusted lead sales (Line 26) and Lines 36 through 38 for adjusted zinc sales (Line 39).

Line 40—Primary Metal Revenues. Enter for each fiscal year the sum of Lines 13, 26 and 39.

Line 41—Toll Concentrates Processed. Report in thousands of tons the total quantity of toll concentrates processed during each fiscal year.

Lines 42 to 45—Unaffiliated Customer Toll Revenues. Report for each fiscal year the quantity of toll concentrates processed for unaffiliated customers (Line 42), total operating revenues derived from this processing (Line 43), average price charged per ton of concentrate processed (Line 44 = Line 43/42) and the average quality rating assigned to toll concentrates processed for unaffiliated customers (Line 45).

Lines 46 to 49—Affiliated Customer Toll Revenues. Report for each fiscal year the quantity of toll concentrates processed for affiliated customers (Line 46), total operating revenues derived from such processing (Line 47), average price charged per ton of concentrate processed (Line 48 = Line 47/46) and the average quality rating (Line 49) assigned to toll concentrates processed for affiliated customers.

Line 50—Tolling Service Revenues. Enter for each fiscal year the total of amounts reported on Lines 43 and 47.

Line 51—Transfer Price Adjustments. Report operating revenue adjustments required to equate affiliated customer transfer prices with market prices charged to unaffiliated customers on the smelter's tolling services. Attach as part of Exhibit B an explanation of the method used for restating transfer prices where such adjustments are necessary.

Line 52—Other Revenue Adjustments. Report other adjustments applicable to the smelter's tolling service revenues. Attach as part of Exhibit B a schedule reporting the types and amounts of such adjustments.

Line 53—Adjusted Tolling Service Revenues. Enter for each fiscal year the total of amounts reported on Lines 50 through 52.

Line 54—Co-Product Revenues. Report the net revenues for each year from sales of co-products derived from the smelter's operations. Attach as part of Exhibit B a schedule showing by individual type of co-product, the quantity produced and sold, market price per unit of sales and total revenues derived from the co-product sales.

Line 55—Pollution Control By-product Revenues. Report revenues from the sale of by-products derived from operation of the smelter's pollution control facilities. Attach as part of Exhibit B a schedule showing by type of by-product produced, the quantity of output, market price received per unit of output sold and total revenue derived from the by-product sales.

Line 56—Other By-product Revenues. Report revenues from the sales of gold, silver, and other by-products derived from the smelter's operations. Attach as part of Exhibit B a schedule providing additional documentation as specified in the instructions for Line 55.

Line 57—Total Co-product and By-product Revenues. Enter for each year the total of Lines 54 through 56.

Supplemental Historical Cost Data—Schedule B.1.B

General

Report annual costs and input quantities for smelter operations by line item under each column for the years indicated by this schedule.

Line 01—Total Quantity Purchased. Report for each year the total quantity of concentrates purchased by the smelter. This will be sum of Lines 02 and 06. Do not include the quantity of toll concentrates.

Line 02—Quantity Purchased. Report for each year the total quantity of concentrates purchased from unaffiliated suppliers by the smelter. Attach as a part of Exhibit B a description of the types and grades of these concentrates. Do not include the quantity of toll concentrates.

Line 03—Concentrate Cost. Report for each year the outlays paid to unaffiliated suppliers for concentrates. Attach as part of Exhibit B an explanation of the method or methods used in determining these outlays and relationship between concentrate prices and the types and grades of concentrates purchased from unaffiliated suppliers.

Line 04—Average Unit Price. Report for each year the average unit price paid for purchases of concentrates from unaffiliated suppliers. Generally, this value will be equivalent to Line 03 divided by Line 02. If this equivalency does not hold, attach as a part of Exhibit B an explanation of the variance.

Line 05—Average Concentrate Grade. Report for each year the average concentrate grade of concentrates purchased from unaffiliated suppliers. Attach as part of Exhibit B an explanation of this average. The average should correspond to the average price reported in Line 04.

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Line 06—Quantity Purchases. Report for each year the total quantity of concentrates purchased from affiliated suppliers by the smelter. Attach as part of Exhibit B a description of the types and grades of these concentrates. Do not include the quantity of toll concentrates.

Line 07—Concentrate Cost. Report for each year the actual outlays paid to affiliated suppliers for concentrates. Attach as part of Exhibit B an explanation of the method or methods used in determining these outlays and relationship between concentrate prices and the types and grades of concentrates purchased from affiliated suppliers. Do not reflect any adjustments to market prices here.

Line 08—Average Unit Price. Report for each year the average unit price paid for purchases of concentrates from affiliated suppliers. Generally, this value will be equivalent to Line 07 divided by Line 06. If this equivalency does not hold, attach as part of Exhibit B an explanation of the variance.

Line 09—Average Concentrate Grade. Report for each year the average concentrate grade of concentrates purchased from affiliated suppliers. Attach as part of Exhibit B an explanation of this average. The average should correspond to the average price reported in Line 08.

Line 10—Total Concentrate Costs. Enter the sum of Line 03 and Line 07 for each year.

Line 11—Transfer Price Adjustments. Enter the amounts required to adjust outlays paid to affiliated suppliers to market value. Attach as part of Exhibit B a description of and the computations of any required cost adjustments.

Line 12—Other Cost Adjustments. Enter the amounts of any other cost adjustments required such as freight or allowances. Attach as part of Exhibit B the identification and the derivation of these adjustments.

Line 13—Adjusted Concentrate Cost. Enter for each year the adjusted concentrate cost reflecting the adjustments reported in Lines 11 and 12.

Line 14—Direct Labor Hours. Report for each year the quantity of direct labor hours required to support the processing levels previously reported. Attach as part of Exhibit B an explanation of the labor productivity factors involved.

Line 15—Average Hourly Wage Rate. Report for each year the average wage rate paid per unit of direct labor input. Attach as part of Exhibit B a description of direct labor cost factors under existing labor contracts and an explanation of the method or methods used to determine wage rates.

Line 16—Total Wage Payments. Enter for each year the product of Lines 14 and 15.

Line 17—Supplemental Employee Benefits. Report adjustments required to direct labor costs for other employee compensation under supplemental benefit plans. Attach as part of Exhibit B a description of such plans and their costs and an explanation of the method or methods used to determine such costs.

Line 18—Total Production Labor Cost. Enter for each year the total of Lines 16 and 17.

Lines 19, 22, 25, 28 and 31—Energy Quantities. Report for each year the quantity of energy by type required to support the processing levels reported in the smelter's revenue. Attach as part of Exhibit B, an explanation of energy use factors and qualities considered in determining the smelters energy requirements.

Lines 20, 23, 26, 29 and 32—Unit Prices. Report for each year the a price paid per unit of energy input by type of energy. Attach as part of Exhibit B, a description of the energy price factors under existing energy contracts and an explanation of the method or methods used to determine unit energy prices.

Lines 21, 24, 27, 30 and 33—Total Payments. Enter the products of quantity and prices paid for electricity (Lines 19 × 20), natural gas (Lines 22 × 23), coal (Lines 25 × 26), fuel oil (Lines 28 × 29), and other (Lines 31 × 32).

Line 34—Total Energy Costs. Enter for each year the total of Lines 21, 24, 27, 30 and 33.

Historical Capital Investment Summary—Schedule B.2

General

Report annual end-of-period asset investments and current liabilities associated during the fiscal years reported in Schedule B.1 with operation of the smelter subject to this NSO application.

The amounts assigned to the subject smelter should include both (1) investments and liabilities directly identifiable with the smelter's operating activities and (2) asset investments shared with other segments to the extent that a specific causal and beneficial relationship can be established for the inter-segment allocation of such investments. Do not allocate to the smelter the costs of assets maintained for general corporate purposes. Provide a detailed explanation of amounts classified as nontraceable on a separate schedule and attach as part of Exhibit B.

Applicants shall also restate trade receivables and payables for transfer price adjustments on the smelter's transactions with affiliated customers.

Line 01—Cash on Hand and Deposit. Report total cash balances assignable to the

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smelter's operations at the end of each fiscal year on the basis of causal and beneficial relationships with total corporate activities. Attach as part of Exhibit B an explanation of the basis used for allocation.

Line 02—Temporary Cash Investments. Report temporary cash investments in time deposits or other short-term securities. Include only those investments either held by the smelter to meet current-period tax payments and other budgeted expenditures specifically identifiable with the smelters continued operation. Exclude any temporary cash investments for which no specific future outlay requirement can be identified.

Attach as part of Exhibit B a schedule classifying temporary cash investments according to identifiable budgeted expenditure requirements.

Lines 03 and 04—Net Trade Receivables. Report trade accounts and notes, net of reserves for uncollectible items, assignable to the smelter in relation to its unaffiliated (Line 03) and affiliated (Line 04) customer sales and transfers. Trade receivables reported by the smelter as due from affiliated customers should be stated or, if necessary, restated on credit terms equivalent to those received by unaffiliated customers on a sale of comparable products. Attach as part of Exhibit B a schedule showing adjustments in the smelter's receivables investments required to equate trade credit terms extended to affiliated and unaffiliated customers.

Lines 05 and 06—Inventory Investments. Report respective end-of-period investments in raw material, work-in-process and finished good inventories held to support the smelter's production and sale of products (Line 05) and associated inventories of other materials and supplies (Line 06). Inventory purchases from affiliated suppliers should be stated or, if necessary, restated at market prices prevailing on purchases from unaffiliated suppliers. Attach as part of Exhibit B a schedule (1) describing whether inventories have been valued on a last-in-first-out (LIFO), first-in-first-out (FIFO) or other cost allocation process, (2) describing the smelter's transfer pricing policies on inventory purchases from affiliated suppliers and (3) presenting adjustments required in reported inventory investments to reflect restatements of transfer prices on purchases from affiliated suppliers.

Line 07—Other Current Assets. Report prepaid expenses, deferred charges, non-trade notes and accounts receivable, and other assets classified as current for certified financial statement reporting purposes that are assignable to the smelter's operations. Attach as part of Exhibit B a schedule classifying these other current assets according to their types and amounts.

Line 08—Total Current Assets. Enter the total of amounts reported on Lines 01 through 07 for each fiscal year.

Lines 09 to 14—Property, Plant and Equipment. Report by individual line item property, plant and equipment investments assignable to smelter operations for each fiscal year. Include in gross facility investments at the end of each period both (1) property, plant and equipment directly associated with the smelter's operations and (2) facilities shared with other operating segments to the extent that a causal and beneficial relationship can be established for the inter-segment allocation of such facility investments.

Attach as part of Exhibit B a schedule reporting by individual line item the annual capital expenditures on additional property, plant and equipment investments in the smelter's operations. Further classify these annual capital expenditures into both (1) investments required to maintain the smelter versus investments in smelter expansion and improvement and (2) direct facility versus joint-use facility investments. Explain the method used for allocating capital expenditures on joint-use facilities to the smelter's operations. Refer to Line 17 instructions for additional reporting requirements on the smelter's facility investments.

Line 15—Total Smelter Investment. Enter the total of amounts reported on Lines 09 through 14 for each fiscal year.

Line 16—Accumulated Depreciation and Amortization. Report accumulated depreciation, amortization and other valuation charges recorded for certified financial statement reporting purposes in relation to smelter investment as reported on Line 15. Other valuation charges are defined in Financial Accounting Standards Board (FASB) Statement No. 19 as losses recognized in connection with an impairment in the value of an unimproved property below its acquisition cost. Refer to Line 17 instructions for additional reporting requirements on smelter facility investments.

Line 17—Net Smelter Investment. Enter the amount reported on Line 15 minus the amount reported on Line 16 for each fiscal year. Attach as part of Exhibit B a schedule classifying gross facility investments, accumulated depreciation, amortization charges, and net facility investments by major pollution control and non-pollution control components. Identify for each asset component the direct versus joint-use investments assigned to the smelter and explain the basis used to allocate amounts associated with joint-use facilities to the smelter.

Line 18—Other Non-Current Assets. Report other assets assignable to the smelter's operations for each fiscal year. Attach as part of Exhibit B a schedule reporting by

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type and amount the major components of such investments.

Line 19—Total Smelter Capital Investment. Enter the total of amounts reported on Lines 08, 17 and 18 for each fiscal year.

Lines 20 and 21—Trade Accounts and Notes Payable. Report trade accounts and notes due on the smelter's purchases from unaffiliated suppliers (Line 20) and on its inter-segment transfers or purchases from affiliated suppliers (Line 21) Trade payables reported by the smelter as due to affiliated suppliers should be stated or, if necessary, restated on terms equivalent to those received from unaffiliated suppliers on a purchase of comparable materials. Attach as part of Exhibit B a schedule showing adjustments required on the smelter's trade payables to equate trade credit terms received from affiliated and unaffiliated suppliers.

Line 22—Other Expense Accruals. Report payments classified as current for salaries and wages, other employee benefits, operating taxes and related operated expenses assignable to the smelter's operations during each fiscal year. Attach as part of Exhibit B a schedule classifying by type and amount the major components of such accruals.

Line 23—Current Notes Payable. Report payments due to nontrade creditors on short-term financing arrangements directly associated with the smelter's operations. Exclude current installments due on long-term debt financing arrangements, notes due to officers and directors, intersegment loans or advances and loans or advances from affiliated operating segments.

Line 24—Other Current Liabilities. Report other nontrade payables classified as current obligations assignable to the smelter's operations.

Line 25—Total Current Liabilities. Enter the total of amounts reported on Lines 20 through 24 for each fiscal year.

Line 26—Net Smelter Capital Investment. Enter the amount reported on Line 19 minus the amount reported on Line 25 for each fiscal year.

Cash Proceeds From Liquidation—Schedule B.2.A

General

Applicants should determine the current salvage value of their existing investment in the smelter as the net proceeds that could be derived through an orderly liquidation of the smelter's assets. The net cash proceeds should be reported after an appropriate allowance for disposal costs, contractual claims against the smelter (e.g., labor termination penalties), and income tax effects on the corporation of such liquidation costs.

The applicant must stipulate the most advantageous alternative market (use) for the smelter's facilities. Generally, this market will be:

- Secondary market for used plant and equipment.
- Sale for scrap.
- Abandonment where the disposal cost exceeds scrap value.

The current net salvage value should be disaggregated into the same property, plant and equipment asset groups reported under the historical capital investment summary, Schedule B.2.

Line 01—Current Assets. Enter in Columns 1 and 2, the value of total current assets shown in Line 08 of Schedule B.2 (Historical Capital Investment Summary) for 1978. No gain or loss should be reported in Columns 3 through 5 for the liquidation of current asset investments.

Lines 02-07—Property Plant and Equipment. Enter in Column 1 the appraised liquidation value (in terms of pretax cash proceeds) of the smelter by asset group. This estimate should be certified by a qualified third party professional appraiser and shall represent the best use and highest alternative value of these assets. The liquidation value of any assets which are jointly used by the smelter and other operating segments shall be excluded if, upon closure of the smelter, such assets would continue in service for the non-smelter activity.

In Column 2, report the net book value of these assets for which liquidation values have been reported in Column 1. The reported values should correspond with amounts reported for 1978 in lines 09 through 15 in Schedule B.2 as adjusted for appropriate eliminations of joint-use facilities and reconciliation to a net book value as reported for income taxes. Attach as part of Exhibit B supporting schedules showing all adjustments and conversion of net book value as reported on the financial statements to net book value, that would be used for income tax purposes.

Compute Column 3 as Column 1 less Column 2. The gain (or loss) shown in Column 3 shall be segregated into ordinary income and capital gains components subject to taxation pursuant to applicable income tax rules. Enter ordinary income in Column 4 and capital gains in Column 5.

Line 08—Total Smelter Investment. Enter the sum of lines 02 through 07 for each of the columns.

Line 09—Other Non-current Assets. In Column 1, report the appraised value of other non-current assets in accordance with the instructions for Line 18, Schedule B.2, *except* that any joint asset(s) that would continue in the event of smelter liquidation shall be excluded. This estimate shall be certified by a qualified third party professional appraiser.

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In Column 2, report the net book value of the non-current assets directly corresponding to those assets included in the liquidation value estimated under Column 1.

The remaining columns shall be completed in accordance with the instructions given above for Lines 02 to 06.

Line 10—Total Smelter Value. Enter the sum of Lines 01, 08 and 09.

Line 11—Total Current Liabilities. Report in both Columns 1 and 2, the value of total current liabilities shown in Line 25 of Schedule B.2 for 1978.

Line 12—Gross Liquidation Value. Line 10 less Line 11.

Line 13—Liquidation Costs. In Columns 1, 3 and 4, report the value of any liquidation costs such as labor contract termination penalties, severance pay and related costs, associated with closure of the smelter.

Line 14—Taxable Gain (or Loss). Enter in Columns 4 and 5, the differences between Line 12 less Line 13.

Line 15—Income Tax Rate. Enter the sum of the Federal, state and local marginal tax rates of the firm for ordinary income and capital gains in columns 4 and 5, respectively. Attach as part of Exhibit B a schedule detailing the estimated marginal tax rate by taxing entity.

Line 16—Income Tax on Gain (or Loss). In Columns 4 and 5, enter the product of Line 14 multiplied by the marginal income tax rates reported in Line 15. In Column 1 enter the sum of Column 4 plus Column 5.

Line 17—After-Tax Cash Proceeds. Line 12 less Lines 13 and 16. This computation applies to Column 1 only.

Constant Controls Forecast Profit and Loss Summary—Schedule C.1

General

Report annual forecasts of operating revenues, operating costs and income taxes anticipated during calendar years 1980 through 1986 from operation of the smelter subject to this NSO application. These *constant controls forecasts should be based on an assumption that the applicant immediately implements a program of additional pollution control facility investments sufficient to achieve full compliance* with the smelter's SIP stack emission limitations for sulfur dioxide.

The assumed investment program should be based on whichever adequately demonstrated system, applicable to the smelter, that would be most economically beneficial subsequent to installation of the system. For this purpose, adequately demonstrated systems include the technology underlying EPA's new source performance standards for copper, lead and zinc smelters (40 CFR Part 60, Subparts P, Q and R) and the following control systems: Magnesium oxide concentration, lime/limestone scrubbing and ammonia scrubbing.

Copper smelters which will process concentrates containing an average of 1,000 pounds per hour or more of arsenic during the forecast period should assume that they will be required to use best engineering techniques to control fugitive emissions of arsenic. All smelters should assume that they will be required to install whatever technically feasible equipment is necessary to reduce their process and fugitive emissions of lead enough to achieve a concentration of 1.5 micrograms per cubic meter (mg/m^3) on a 90-day average basis in the ambient air by January 1, 1985. All smelters should also assume that they will be required to meet all other regulatory requirements in effect at the time the application is made.

Line 01—Primary Metal Sales Revenue. Enter the totals reported in Schedule C.1.a, Line 40.

Line 02—Co-product and By-product Sales Revenue. Enter the totals reported in Schedule C.1.a, Line 57.

Line 03—Tolling Service Revenues. Enter the totals reported in Schedule C.1.a, Line 53.

Line 04—Other Operating Revenues. Report operating revenues anticipated from sources not accounted for under Lines 01 through 03. Refer to instructions for Line 04 in Schedule B.1 for items that should not be included in "other" operating revenues. Attach as part of Exhibit B a schedule showing annual amounts forecasted by individual revenue component for "other" operating revenues associated with the smelter's forecast constant controls operations. Identify in the supporting schedule any differences in the "other" revenue components reported in Schedules B.1 and C.1 and explain the reasons for such differences.

Line 05—Total Operating Revenues. Report the total of amounts reported under Lines 01 through 04.

Line 06—Concentrate Costs. Enter the totals reported in Schedule C.1.b, Line 13.

Line 07—Other Material Costs. Report total costs forecasted for flux, refractories, coke and other materials directly associated with the smelter's processing of concentrates. Attach as part of Exhibit B a schedule showing the annual amounts forecasted by major material cost components. For each cost component, identify the forecasted quantity and unit price elements of material cost and explain the basis for forecasting these quantity and price elements. Identify in the supporting schedule any differences in the "other" material cost components shown in Schedules B.1 and C.1 and explain the reasons for such differences.

Line 08—Production Labor Costs. Enter the totals reported for the years 1980 through 1986 in Schedule C.1.b, Line 18.

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Line 09—Energy Costs. Enter the totals reported for the years 1980 through 1986 in Schedule C.1.b, Line 34.

Line 10—Pollution Control Costs. Report the total costs forecasted for expenses identifiable with operation and maintenance of the additional pollution control equipment and facilities to achieve constant controls. By-product credits associated with operation of the pollution control facilities should be eliminated from the cost accounts and reclassified to Schedule C.1.a, Line 55. Attach a schedule as part of Exhibit B classifying pollution control costs by major cost components. Explain the basis used for estimating each of the cost components.

Line 11—Production Overhead Costs. Report the total costs forecasted for indirect labor, indirect materials and other production overhead costs associated with the smelter's constant controls forecasts. Attach as part of Exhibit B a schedule showing annual overhead costs projected by major cost components associated with the smelter's operations. For each cost component, where appropriate, identify the forecasted quantity and unit price elements of overhead costs and explain the basis for estimating these quantity and price elements. Also identify in the supporting schedule any differences in production overhead cost classifications used in Schedules B.1 and C.1 and explain the reasons for such differences.

Line 12—Other Production Costs. Report other forecasted production costs not previously reported on Lines 06 through 11. Attach as part of Exhibit B supporting schedules showing the basis of the forecasts.

Line 13—Total Cost of Sales. Report the sum of operating costs reported on Lines 06 through 12.

Line 14—Gross Operating Profit. Report the difference between Line 05 minus Line 13.

Line 15—Selling, General and Administrative Expenses. Report the total costs forecasted for administrative, marketing and general corporate overhead functions that directly or indirectly support the smelter's operations. Refer to the NSO Financial Reporting Overview for a general discussion of indirect cost allocations from overhead cost pools. Attach as part of Exhibit B a schedule classifying selling, general and administrative expenses into major cost components. Indicate whether each component represents costs directly assignable to the smelter or indirect costs allocated from other business segments to the smelter. Explain the basis used for estimating the amount of expected costs included in each component and the basis used for allocating indirect cost elements to the smelter. Identify and explain any differences in the selling, general and administrative cost classification used in Schedules B.1 and C.1.

Line 16—Taxes, Other than Income Taxes. Report the total costs forecasted for property taxes and associated levies paid to governmental units by or for the benefit of the firm's smelter operations. Attach as part of Exhibit B a schedule classifying operating taxes by major cost components. Indicate whether each cost component represents costs directly assignable to the smelter or indirect costs allocated from overhead cost pools. Explain the basis used for estimating the costs included in each component and the basis for allocating indirect taxes to the smelter. Identify and explain any differences in the component classifications used in Schedules B.1 and C.1.

Line 17—Exploration and Research Costs. Report the total estimates of costs incurred directly by or for the benefit of the smelter operations. Attach as part of Exhibit B a schedule classifying the costs by major direct and indirect cost components. Explain the basis for estimating the costs assigned to each component. Identify and explain any differences in pro forma versus historical cost classifications used in Schedules B.1 and C.1.

Line 18—Pollution Control Facility Depreciation and Amortization. Report the estimates of depreciation and amortization charges associated with the smelter's existing investment in constant controls pollution control equipment and facilities. Attach as part of Exhibit B supporting schedules classifying pollution control facilities by major assets or asset groups. For each facility component, indicate the depreciation or amortization method that would be reported for tax purposes. Based on that method, report the original cost of the component assets, undepreciated balance of the component assets, the remaining depreciable life and the annual depreciation or amortization charge. Indicate for each asset component whether the depreciation and amortization charges represent direct cost assignments or indirect cost allocations to the smelter.

Line 19—Other Smelter Facility Depreciation and Amortization. Report the pro forma estimates of depreciation and amortization charges associated with the smelter's investment in equipment and facilities other than those classified as pollution control facilities. Attach as part of Exhibit B supporting schedules prepared according to the instructions for Line 18 above.

Line 20—Interest on Short-Term Debt. Report the estimates of interest and other financing charges on forecasted short-term obligations as classified in the smelter's current liabilities on Schedule B.2. Interest and associated financing charges on long-term debt should *not* be included as an expense identifiable with the smelter's operations. Attach as part of Exhibit B a schedule showing the interest-bearing, short-term

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debt contracts identifiable with the smelter's operations, the interest rate projected for these contracts and the estimated annual interest charges. Identify and explain any differences in the forecasted versus historical classification in Schedules B.1 and C.1 of short-term debt contracts identifiable with the smelter operations.

Line 21—Miscellaneous Operating Expenses. Report only the total operating expenses associated with or allocated to the smelter that cannot be appropriately classified in one of the preceding line items. Attach as part of Exhibit B a schedule showing the classification of these residual operating expenses into major cost components. Explain the basis used for forecasting the cost under each component. Identify each cost component in terms of direct or indirect cost and explain the basis used for allocating the indirect costs to smelter operations. Identify and explain any differences in the forecasted versus historical cost classifications included in Schedules B.1 and C.1.

Line 22—Total Other Operating Expenses. Enter the sum of operating costs reported on Lines 15 through 21.

Line 23—Income From Operations. Report the balance obtained by subtracting Line 22 from Line 14.

Line 24—Income Taxes. Multiply income from operations by the sum of the Federal, state and local marginal tax rates. Attach as part of Exhibit B a schedule detailing the estimated marginal tax rate by taxing entity.

Line 25—Net Income from Operations. Report the balance obtained by subtracting Line 24 from Line 23.

Supplemental Constant Controls Revenue Data—Schedule C.1.a

General

Report forecasts detail of annual indicated operating revenue factors anticipated during the years 1980 through 1986 from operation of the smelter subject to this NSO application. These details shall support the summary revenue forecasts reported on Schedule C.1. Report forecasted information required for each item in a manner consistent with the instructions for Schedule B.1.a. Attach as part of Exhibit B schedules to (1) explain the methods used to make the required forecasts, (2) explain differences, if any, between historical trends and the forecasts and (3) data and information to support the forecasts. The forecast revenue total in Schedule C.1.a shall correspond to those reported on Schedule C.1.

Supplemental Constant Controls Cost Data—Schedule C.1.b

General

Report forecasts of annual indicated operating cost factors anticipated during the years 1980 through 1986 from operation of the smelter subject to this NSO application. These details shall support the summary cost forecasts on Schedule C.1. Report forecasted information required for each item in a manner consistent with the instructions for Schedule B.1.b. Attach as part of Exhibit B schedules to (1) explain the methods used to make the required forecasts, (2) explain differences, if any, between historical trends and the forecasts and (3) data information to support the forecasts. The forecast cost totals in Schedule C.1.b shall correspond to those reported on Schedule C.1.

Constant Controls Sustaining Capital Investment Summary—Schedule C.2

General

The applicant should estimate and report, in Schedule C.2, yearly sustaining capital outlays for maintenance of the smelter's existing productive capability. These estimates should be forecast under the assumption that full compliance with SIP emission limitations for SO_2 will be achieved. Major elements of these outlays should be disclosed, as well as the total of such outlays. Estimates shall be restricted to those items which will be capitalized for tax purposes. These outlays shall primarily be for plant replacement, although outlays for improvements and expansion may be included to the extent that improvements and/or expansion, exclusive of required pollution control outlays, can be justified as economically feasible. Estimates of sustaining capital shall exclude any incremental investment for constant control requirements. Sustaining capital investments in facilities shared with other operating segments shall be allocated in accordance with the instructions given below.

Estimates of sustaining capital shall be compatible with productive capacity and pollution control requirements underlying the operating revenue and cost forecasts incorporated in Schedule C.1.

Lines 01 to 06—Sustaining Capital. Report by individual line item property, plant and equipment sustaining capital investments assignable to smelter operations for each fiscal year. Include both (1) property, plant and equipment directly associated with the smelter's operations and (2) facilities shared with other operating segments to the extent that a causal and beneficial relationship can be established for the intersegment allocation of such facility investments.

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Attach as part of Exhibit B a schedule disclosing by individual line item the major elements of annual capital expenditures for sustaining capital. Further classify these annual capital expenditures into both (1) investments required to maintain the smelter versus investments in smelter expansion and improvements and (2) direct facility versus joint-use facility investments. Explain the method used for allocating capital expenditures on joint-use facilities to the smelter's operations.

Line 07—Total Smelter Sustaining Capital. Enter the total of amounts reported on Lines 01 through 06 for each fiscal year. Transfer the reported total for each year to Schedule A.1, Line 03.

Interim Controls Forecast Profit and Loss Summary—Schedule D.1

General

Report annual forecasts of operating revenues, operating costs and income taxes for the years 1980 through 1986 from operation of the smelter, subject to this controls waiver application. These interim controls *forecasts should be based on an assumption that the applicant immediately implements a program of interim controls.*

The assumed investment program should be based on the installation and operation of a well-designed double-absorption sulfuric acid plant to treat all strong gas streams. The interim controls projection may, but need not, account for other regulatory requirements on the same basis as for other applicants. If this is done, however, it should be assumed that the SO_2 controls are also in an interim controls configuration.

Report forecasted information required by each individual line item in a manner consistent with the instructions for Schedule C.1. Attach as part of Exhibit B supporting schedules describing and explaining any differences between Schedule B.1 and the estimates reported in Schedule D.1. Transfer the appropriate amounts reported for each year from this Schedule to Schedule A.2.

Supplemental Interim Controls Revenue Data—Schedule D.1.a

General

Report forecasted revenue information for each line item in a manner consistent with the instructions for Schedules B.1.a and C.1.a.

Supplemental Interim Controls Cost Data—Schedule D.1.b

General

Report forecasted cost information for each line item in a manner consistent with the instructions for Schedules B.1.g and C.1.b.

Interim Controls Sustaining Capital Investment Summary—Schedule D.2

General

The applicant should estimate and report in Schedule D.2 yearly sustaining capital outlays compatible with productive capacity and control requirements underlying the revenue and cost forecasts reported on Schedule D.1. Report forecasted sustaining capital outlays for each line item in a manner consistent with the instructions for Schedule C.2.

EPA— ----------

Environmental Protection Agency

Primary Nonferrous Smelter Order Application

Part I—IDENTIFICATION INFORMATION

1. Firm name ----------
2. Street/Box/RFD ----------
3. City ----------
4. State ----------
5. Zip Code ----------
6. IRS Employer Identification No. ----------
7. SEC 1934 Act Registration Number ----------
8. Smelter Iden. ----------
9. Street/Box/RFD ----------
10. City ----------
11. State ----------
12. Zip Code ----------
13. Contact Person ----------
14. Title ----------
15. Street/Box/RFD ----------
16. Telephone ----------
17. City ----------
18. State ----------
19. Zip Code ----------

Part II—CERTIFICATION

I certify that the information provided herein and appended hereto is true and accurate to the best of my knowledge. I understand that this information is being required, in part, under the authority of Section 114 of the Clean Air Act, 42 U.S.C. 7414.

Name ----------
Title ----------
Signature ----------
Date ----------

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SCHEDULE A.1—CONSTANT CONTROLS FORECAST SUMMARY

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986	Total
A. Operating cash flow projection:									
1. Net income from operation	01								XXXXX
2. Capital expenditure projections:									
a. Constant controls	02								XXXXX
b. Sustaining capital	03								XXXXX
c. Total	04								XXXXX
3. Adjusted cash flow projections	05								XXXXX
4. Discount factors	06								XXXXX
5. Present value of future cash flows	07								XXXXX
B. Net present value:									
1. Terminal value	08								
2. Discount factor	09								
3. Present value of terminal salvage value	10								
4. Present value of future adjusted cash flows	11								
5. Total present value	12								
6. Current salvage value	13								
7. Net present value	14								

SCHEDULE A.2—INTERIM CONTROLS FORECAST SUMMARY

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986	Total
A. Gross operating profit	01								XXXXX
B. Operating cash flow projection:									
1. Net income from operations	02								XXXXX
2. Depreciation and amortization:									
a. Pollution control facilities	03								XXXXX
b. Other smelter facilities	04								XXXXX
3. Operating cash flow	05								XXXXX
4. Capital expenditure projections:									
a. Interim controls	06								XXXXX
b. Sustaining capital	07								XXXXX
c. Total	08								XXXXX
5. Net cash flow projections	09								XXXXX
6. Discount factors	10								XXXXX
7. Present value of future cash flow	11								XXXXX
C. Net present value:									
1. Terminal value	12								
2. Discount factor	13								
3. Present value of terminal salvage value	14								
4. Present value of future cash flows	15								
5. Total present value	16								
6. Current salvage value	17								
7. Net present value	18								

SCHEDULE B.1—HISTORICAL PROFIT AND LOSS SUMMARY

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
A. Operating revenues:						
1. Primary metal sales	01					
2. Coproduct and byproduct sales	02					
3. Tolling service revenues	03					
4. Other operating revenues	04					
5. Total operating revenues	05					
B Cost of sales:						
1. Concentrates processed	06					
2. Other materials	07					
3. Production labor	08					
4. Energy costs	09					
5. Pollution control cost	10					

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SCHEDULE B.1—HISTORICAL PROFIT AND LOSS SUMMARY—Continued

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
6. Production overhead	11					
7. Other production costs	12					
8. Total cost of sales	13					
C. Gross operating profit	14					
D. Other operating expenses:						
1. Selling, general and administrative	15					
2. Taxes, other than income tax	16					
3. Exploration and research costs	17					
4. Depreciation and amortization:						
a. Pollution control facilities	18					
b. Other smelter facilities	19					
5. Interest on short term debt	20					
6. Miscellaneous operating expenses	21					
7. Total other operating expenses	22					
E. Income from operations	23					
F. Other income and (expense):						
1. Gain/(loss) on disposition of property	24					
2. Miscellaneous other income and (expense)	25					
3. Total other income and (expense)	26					
G. Net taxable income	27					

SCHEDULE B.1.a—SUPPLEMENTAL HISTORICAL REVENUE DATA

[Segment Identification]

	Line	1975	1976	1977	1978	1979
A. Copper product sales:						
1. Total quantity sold	01					
2. Unaffiliated customer sales:						
a. Quantity sold	02					
b. Operating revenue	03					
c. Average unit price	04					
d. Average product grade	05					
3. Affiliated customer sales:						
a. Quantity sold	06					
b. Operating revenue	07					
c. Average unit price	08					
d. Average product grade	09					
4. Adjusted copper revenues:						
a. Total copper revenues	10					
b. Transfer price adjustment	11					
c. Other revenue adjustments	12					
d. Adjusted copper revenues	13					
B. Lead product sales:						
1. Total quantity sold	14					
2. Unaffiliated customer sales:						
a. Quantity sold	15					
b. Operating revenue	16					
c. Average unit price	17					
d. Average product grade	18					
3. Affiliated customer sales:						
a. Quantity sold	19					
b. Operating revenue	20					
c. Average unit price	21					
d. Average product grade	22					
4. Adjusted lead revenues:						
a. Total lead revenues	23					
b. Transfer price adjustment	24					
c. Other revenue adjustments	25					
d. Adjusted lead revenues	26					
C. Zinc product sales:						
1. Total quantity sold	27					
2. Unaffiliated customer sales:						
a. Quantity sold	28					
b. Operating revenue	29					
c. Average unit price	30					

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SCHEDULE B.1.a—SUPPLEMENTAL HISTORICAL REVENUE DATA—Continued

[Segment Identification]

	Line	1975	1976	1977	1978	1979
d. Average product grade	31					
3. Affiliated customer sales:						
a. Quantity sold	32					
b. Operating revenue	33					
c. Average unit price	34					
d. Average product grade	35					
4. Adjusted zinc revenue:						
a. Total zinc revenues	36					
b. Transfer price adjustment	37					
c. Other revenue adjustments	38					
d. Adjusted zinc revenues	39					
D. Primary metal revenues	40					
E. Tolling service revenues:						
1. Total toll concentrates processed	41					
2. Unaffiliated customer revenues:						
a. Concentrates processed	42					
b. Operating revenue	43					
c. Average unit price	44					
d. Average product grade	45					
3. Affiliated customer revenues:						
a. Concentrates processed	46					
b. Operating revenue	47					
c. Average unit price	48					
d. Average product grade	49					
4. Adjusted tolling service revenues:						
a. Total tolling service revenue	50					
b. Transfer price adjustment	51					
c. Other revenue adjustments	52					
d. Adjusted tolling service revenues	53					
F. Coproduct and byproduct sales:						
1. Total coproduct revenues	54					
2. Total byproduct revenues:						
a. Pollution control facilities	55					
b. Other smelter processing	56					
3. Total coproduct and byproduct revenues	57					

SCHEDULE B.1.b—SUPPLEMENTAL HISTORICAL COST DATA

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
A. Concentrate costs:						
1. Total quantity purchased	01					
2. Unaffiliated purchases:						
a. Quantity purchased	02					
b. Concentrate cost	03					
c. Average unit price	04					
d. Average concentrate grade	05					
3. Affiliated purchases:						
a. Quantity purchased	06					
b. Concentrate cost	07					
c. Average unit price	08					
d. Average concentrate grade	09					
4. Adjusted concentrate costs:						
a. Total concentrate costs	10					
b. Transfer price adjustment	11					
c. Other cost adjustments	12					
d. Adjusted concentrate cost	13					
B. Production labor cost:						
1. Direct labor hours	14					
2. Average hourly wage rate	15					
3. Total wage payments	16					
4. Supplemental employee benefits	17					
5. Total production labor cost	18					
6. Affiliated customer revenues						

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SCHEDULE B.1.b—SUPPLEMENTAL HISTORICAL COST DATA—Continued

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
C. Energy costs:						
1. Electricity:						
a. Quantity in kilowatt hours	19					
b. Price per kWh	20					
c. Total electricity payments	21					
2. Natural gas:						
a. Quantity in mcf	22					
b. Price per mcf	23					
c. Total natural gas payments	24					
3. Coal:						
a. Quantity per tons	25					
b. Price per ton	26					
c. Total coal payments	27					
4. Fuel oil:						
a. Quantity in gallons	28					
b. Price per gallon	29					
c. Total fuel oil payments	30					
5. Other (specify):						
a. Quantity (specific units)	31					
b. Price per unit	32					
c. Total payments	33					
6. Total energy costs	34					

SCHEDULE A—CONSTANT CONTROLS FORECAST SUMMARY

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986	Total

SCHEDULE B.2—HISTORICAL CAPITAL INVESTMENT SUMMARY

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
A. Current assets:						
1. Cash on hand and deposit	01					
2. Temporary cash investments	02					
3. Trade receivables, net:						
a. Unaffiliated customers	03					
b. Affiliated customers	04					
4. Inventories:						
a. Raw materials and products	05					
b. Other materials and supplies	06					
5. Other current assets	07					
6. Total current assets	08					
B. Property, plant and equipment:						
1. Land	09					
2. Buildings and improvements	10					
3. Machinery and equipment	11					
4. Transportation equipment	12					
5. Pollution control facilities	13					
6. Other fixed assets	14					
7. Total smelter investment	15					
8. Less: Accumulated depreciation and amortization	16					
9. Net smelter investment	17					
C. Other noncurrent assets	18					
D. Total smelter capital investment	19					
E. Current liabilities:						
1. Trade accounts and notes payable:						
a. Unaffiliated suppliers	20					
b. Affiliated suppliers	21					
2. Other expense accruals	22					
3. Notes payable, current	23					

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SCHEDULE B.2—HISTORICAL CAPITAL INVESTMENT SUMMARY—Continued

[Smelter Identification]

	Line	1975	1976	1977	1978	1979
4. Other current liabilities	24					
5. Total current liabilities	25					
G. Net smelter capital investment	26					

SCHEDULE B.2.a—CASH PROCEEDS FROM LIQUIDATION

[Smelter Identification]

	Line	(1)—Estimated liquidation value	(2)—Reported net book value	(3)—Total gain (loss)	Gain (loss) subject to taxation as—	
					(4)—Ordinary income	(5)—Capital gain
A. Total current assets	01			XXXXX	XXXXX	XXXXX
B. Property, plant and equipment:						
1. Land	02					
2. Buildings and improvements	03					
3. Machinery and equipment	04					
4. Transportation equipment	05					
5. Pollution control facilities	06					
6. Other fixed assets	07					
7. Total	08					
C. Other Noncurrent assets	09					
D. Total smelter value	10					
E. Total current liabilities	11			XXXXX	XXXXX	XXXXX
F. Gross liquidation value	12					
G. Liquidation costs	13		XXXXX			XXXXX
H. Net Taxable Gain (or loss)	14	XXXXX	XXXXX	XXXXX		
I. Income tax rate	15	XXXXX	XXXXX	XXXXX		
J. Income tax on gain (loss)	16		XXXXX	XXXXX		
K. After tax cash proceeds from liquidation	17		XXXXX	XXXXX	XXXXX	XXXXX

SCHEDULE C.1—CONSTANT CONTROLS FORECAST PROFIT AND LOSS SUMMARY

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Operating revenues:								
1. Primary metal sales	01							
2. Coproduct and byproduct sales	02							
3. Tolling service revenues	03							
4. Other operating revenues	04							
5. Total operating revenues	05							
B. Cost of sales:								
1. Concentrates	06							
2. Other materials	07							
3. Production labor	08							
4. Energy costs	09							
5. Production overhead	10							
6. Pollution control costs	11							
7. Other production costs	12							
8. Total cost of sales	13							
C. Gross Operating Profit	14							
D. Other operating expenses:								
1. Selling, general and administrative	15							
2. Taxes, other than income	16							
3. Exploration and research costs	17							
4. Depreciation and amortization:								
a. Pollution control facilities	18							
b. Other smelter facilities	19							
5. Interest on short-term debt	20							
6. Miscellaneous operating expenses	21							
7. Total other operating expenses	22							

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SCHEDULE C.1—CONSTANT CONTROLS FORECAST PROFIT AND LOSS SUMMARY—Continued

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
E. Income from operations	23							
F. Income taxes	24							
G. Net income from operations	25							

SCHEDULE C.1.a—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Forecasted copper product sales:								
1. Total quantity sold	01							
2. Unaffiliated customer sales:								
a. Quantity sold	02							
b. Operating revenue	03							
c. Average unit price	04							
d. Average product grade	05							
3. Affiliated customer sales:								
a. Quantity sold	06							
b. Operating revenue	07							
c. Average unit price	08							
d. Average product grade	09							
4. Adjusted copper revenues:								
a. Total copper revenues	10							
b. Transfer price adjustment	11							
c. Other revenue adjustments	12							
d. Adjusted copper revenues	13							
B. Forecasted lead product sales:								
1. Total quantity sold	14							
2. Unaffiliated customer sales:								
a. Quantity sold	15							
b. Operating revenue	16							
c. Average unit price	17							
d. Average product grade	18							
3. Affiliated customer sales:								
a. Quantity sold	19							
b. Operating revenue	20							
c. Average unit price	21							
d. Average product grade	22							
4. Adjusted lead revenues:								
a. Total lead revenues	23							
b. Transfer price adjustments	24							
c. Other revenue adjustments	25							
d. Adjusted lead revenues	26							
C. Forecasted zinc product sales:								
1. Total quantity sold	27							
2. Unaffiliated Customer sales:								
a. Quantity sold	28							
b. Operating revenue	29							
c. Average unit price	30							
d. Average product grade	31							
3. Affiliated customer sales:								
a. Quantity sold	32							
b. Operating revenue	33							
c. Average unit price	34							
d. Average product grade	35							
4. Adjusted zinc revenue:								
a. Total zinc revenues	36							
b. Transfer price adjustment	37							
c. Other revenue adjustments	38							
d. Adjusted zinc revenues	39							
D Forecasted primary metal revenues								
E. Forecasted tolling service revenues:								
1. Total toll concentrates processed	40							
2. Unaffiliated customer revenues:								
a. Concentrates processed	41							
b. Operating revenue	42							

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SCHEDULE C.1.a—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA—Continued

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
c. Average unit price	43							
d. Average product grade	44							
3. Affiliated customer revenues:								
a. Concentrates processed	45							
b. Operating revenue	46							
c. Average unit price	47							
d. Average product grade	48							
4. Adjusted tolling service revenues:								
a. Total tolling service revenues	49							
b. Transfer price adjustments	50							
c. Other revenue adjustments	51							
d. Adjusted tolling service revenue	52							
F. Co-product and by-product sales:								
1. Total co-product revenues	55							
2. Total by-product revenues from:								
a. Pollution control facilities	56							
b. Other smelter processing	57							
3. Total co-product and by-product revenues	58							

SCHEDULE C.1.b—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Forecasted concentrate costs:								
1. Total quantity purchased	01							
2. Unaffiliated purchases:								
a. Quantity purchased	02							
b. Concentrate cost	03							
c. Average unit price	04							
d. Average concentrate grade	05							
3. Affiliated purchases:								
a. Quantity purchased	06							
b. Concentrate cost	07							
c. Average unit price	08							
d. Average concentrate grade	09							
4. Adjusted concentrate costs:								
a. Total concentrate costs	10							
b. Transfer price adjustment	11							
c. Other cost adjustments	12							
d. Adjusted concentrate cost	13							
B. Forecasted production labor cost:								
1. Direct labor hours	14							
2. Average hourly wage rate	15							
3. Total wage payments	16							
4. Supplemental employee benefits	17							
5. Total production labor cost	18							
C. Forecasted Energy Costs:								
1. Electricity:								
a. Quantity in kilowatt hours	19							
b. Price per kwh	20							
c. Total electricity payments	21							
2. Natural gas:								
a. Quantity in mcf	22							
b. Price per mcf	23							
c. Total natural gas payments	24							
3. Coal:								
a. Quantity per tons	25							
b. Price per ton	26							
c. Total coal payments	27							
4. Fuel oil:								
a. Quantity in gallons	28							
b. Price per gallon	29							
c. Total fuel oil payments	30							
5. Other (specify):								
a. Quantity (specific units)	31							

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SCHEDULE C.1.b—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA—Continued

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
b. Price per unit	32							
c. Total payments	33							
6. Total energy costs	34							

SCHEDULE C.2—CONSTANT CONTROLS SUSTAINING CAPITAL INVESTMENT SUMMARY

[Smelter Identification]

Sustaining capital	Line	1980	1981	1982	1983	1984	1985	1986
1. Land	01							
2. Buildings and improvements	02							
3. Machinery and equipment	03							
4. Transportation equipment	04							
5. Pollution control facilities	05							
6. Other fixed assets	06							
7. Total smelter sustaining capital	07							

SCHEDULE D.1—INTERIM CONTROLS FORECAST PROFIT AND LOSS SUMMARY

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Operating revenues:								
1. Primary metal sales	01							
2. Co-product and by-product sales	02							
3. Tolling service revenues	03							
4. Other operating revenues	04							
5. Total operating revenues	05							
B. Cost of sales:								
1. Concentrates	06							
2. Other materials	07							
3. Production labor	08							
4. Energy costs	09							
5. Pollution control costs	10							
6. Production overhead	11							
7. Other production costs	12							
8. Total cost of sales	13							
C. Gross operating profit	14							
D. Other operating expenses:								
1. Selling, general and administrative	15							
2. Taxes, other than income tax	16							
3. Exploration and research costs	17							
4. Depreciation and amortization:								
a. Pollution control facilities	18							
b. Other smelter facilities	19							
5. Interest on short-term debt	20							
6. Miscellaneous operating expenses	21							
7. Total other operating expenses	22							
E. Income from operations	23							
F. Income taxes	24							
G. Net income from operations	25							

SCHEDULE D.1.a—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Forecasted copper product sales:								
1. Total Quantity Sold	01							
2. Unaffiliated customer sales:								
a. Quantity sold	02							

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SCHEDULE D.1.a—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA—Continued

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
b. Operating revenue	03							
c. Average unit price	04							
d. Average product grade	05							
3. Affiliated customer sales:								
a. Quantity sold	06							
b. Operating revenue	07							
c. Average unit price	08							
d. Average product grade	09							
4. Adjusted copper revenues:								
a. Total copper revenues	10							
b. Transfer price adjustment	11							
c. Other revenue adjustments	12							
d. Adjusted copper revenues	13							
B. Forecasted lead product sales:								
1. Total quantity sold	14							
2. Unaffiliated customer sales:								
a. Quantity sold	15							
b. Operating revenue	16							
c. Average unit price	17							
d. Average product grade	18							
3. Affiliated customer sales:								
a. Quantity sold	19							
b. Operating revenue	20							
c. Average unit price	21							
d. Average product grade	22							
4. Adjusted lead revenues:								
a. Total lead revenues	23							
b. Transfer price adjustments	24							
c. Other revenue adjustments	25							
d. Adjusted lead revenues	26							
C. Forecasted zinc product sales:								
1. Total quantity sold	27							
2. Unaffiliated customer sales:								
a. Quantity sold	28							
b. Operating revenue	29							
c. Average unit price	30							
d. Average product grade	31							
3. Affiliated customer sales:								
a. Quantity sold	32							
b. Operating revenue	33							
c. Average unit price	34							
d. Average product grade	35							
4. Adjusted zinc revenue:								
a. Total zinc revenues	36							
b. Transfer price adjustment	37							
c. Other revenue adjustments	38							
d. Adjusted zinc revenues	39							
D. Forecasted primary metal revenues	40							
E. Forecasted tolling services revenues:								
1. Total toll concentrates processed	41							
2. Unaffiliated customer revenues:								
a. Concentrates processed	42							
b. Operating revenue	43							
c. Average unit price	44							
d. Average product grade	45							
3. Affiliated customer revenues:								
a. Concentrates processed	46							
b. Operating revenue	47							
c. Average unit price	48							
d. Average product grade	49							
4. Adjusted tolling service revenues:								
a. Total tolling service revenue	50							
b. Transfer price adjustment	51							
c. Other revenue adjustments	52							
d. Adjusted tolling service revenues	53							
F. Co-product and by-product sales:								
1. Total coproduct revenues	54							
2. Total byproduct revenues from:								
a. Pollution control facilities	55							

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SCHEDULE D.1.a—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA—Continued

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
b. Other smelter processing	56							
3. Total coproduct and byproduct revenues	57							

SCHEDULE D.1.b—SUPPLEMENTAL CONSTANT CONTROLS REVENUE DATA

[Smelter Identification]

	Line	1980	1981	1982	1983	1984	1985	1986
A. Forecasted concentrate costs:								
1. Total quantity purchased	01							
2. Unaffiliated purchases:								
a. Quantity purchased	02							
b. Concentrate cost	03							
c. Average unit price	04							
d. Average concentrate grade	05							
3. Affiliated purchases:								
a. Quantity purchased	06							
b. Concentrate cost	07							
c. Average unit price	08							
d. Average concentrate grade	09							
4. Adjusted concentrate costs:								
a. Total concentrate costs	10							
b. Transfer price adjustment	11							
c. Other cost adjustments	12							
d. Adjusted concentrate cost	13							
B. Forecasted production labor cost:								
1. Direct Labor Hours	14							
2. Average Hourly Wage Rate	15							
3. Total Wage Payments	16							
4. Supplemental Employee Benefits	17							
5. Total Production Labor Cost	18							
C. Forecasted energy costs:								
1. Electricity:								
a. Quantity in kilowatt hours	19							
b. Price per kwh	20							
c. Total electricity payments	21							
2. Natural gas:								
a. Quantity in mcf	22							
b. Price per mcf	23							
c. Total natural gas payments	24							
3. Coal:								
a. Quantity per tons	25							
b. Price per ton	26							
c. Total coal payments	27							
4. Fuel oil:								
a. Quantity in gallons	28							
b. Price per gallon	29							
c. Total fuel oil payments	30							
5. Other (specify):								
a. Quantity (specific units)	31							
b. Price per unit	32							
c. Total payments	33							
6. Total energy costs	34							

SCHEDULE D.2—CONSTANT CONTROLS SUSTAINING CAPITAL INVESTMENT SUMMARY

[Smelter Identification]

Sustaining capital	Line	1980	1981	1982	1983	1984	1985	1986
1. Land	01							
2. Buildings and improvements	02							
3. Machinery and equipment	03							
4. Transportation equipment	04							
5. Pollution control facilities	05							

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SCHEDULE D.2—CONSTANT CONTROLS SUSTAINING CAPITAL INVESTMENT SUMMARY—Continued

[Smelter Identification]

Sustaining capital	Line	1980	1981	1982	1983	1984	1985	1986
6. Other fixed assets	06							
7. Total smelter sustaining capital	07							

[45 FR 42536, June 24, 1980, as amended at 45 FR 85015, Dec. 24, 1980]

PART 58—AMBIENT AIR QUALITY SURVEILLANCE

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APPENDIX A—QUALITY ASSURANCE REQUIREMENTS FOR STATE AND LOCAL AIR MONITORING STATIONS (SLAMS)
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APPENDIX F—ANNUAL SLAMS AIR QUALITY INFORMATION
APPENDIX G—UNIFORM AIR QUALITY INDEX AND DAILY REPORTING

AUTHORITY: Secs. 110, 301(a), 313, and 319 of the Clean Air Act (42 U.S.C. 7410, 7601(a), 7613, 7619), unless otherwise noted.

SOURCE: 44 FR 27571, May 10, 1979, unless otherwise noted.

Subpart A—General Provisions

§ 58.1 Definitions.

As used in this part, all terms not defined herein have the meaning given them in the Act:

(a) "Act" means the Clean Air Act as amended (42 U.S.C. 7401, et seq.).

(b) "SLAMS" means State or Local Air Monitoring Station(s). The SLAMS make up the ambient air quality monitoring network which is required by § 58.20 to be provided for in the State's implementation plan. This definition places no restrictions on the use of the physical structure or facility housing the SLAMS. Any combination of SLAMS and any other monitors (Special Purpose, NAMS, PSD) may occupy the same facility or structure without affecting the respective definitions of those monitoring station.

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(c) "NAMS" means National Air Monitoring Station(s). Collectively the NAMS are a subset of the SLAMS ambient air quality monitoring network.

(d) "PSD station" means any station operated for the purpose of establishing the effect on air quality of the emissions from a proposed source for purposes of prevention of significant deterioration as required by § 51.24(n) of Part 51 of this chapter.

(e) "SO_2" means sulfur dioxide.

(f) "NO_2" means nitrogen dioxide.

(g) "CO" means carbon monoxide.

(h) "O_3" means ozone.

(i) "Plan" means an implementation plan, approved or promulgated pursuant to section 110 of the Clean Air Act.

(j) "Administrator" means the Administrator of the Environmental Protection Agency (EPA) or his or her authorized representative.

(k) "Regional Administrator" means the Administrator of one of the ten EPA Regional Offices or his or her authorized representative.

(l) "State agency" means the air pollution control agency primarily responsible for development and implementation of a plan under the Act.

(m) "Local agency" means any local government agency, other than the State agency, which is charged with the responsibility for carrying out a portion of the plan.

(n) "Indian Reservation" means any Federally recognized reservation established by treaty, agreement, executive order, or act of Congress.

(o) "Indian Governing Body" means the governing body of any tribe, band, or group of Indians subject to the jurisdiction of the United States and recognized by the United States as possessing power of self-government.

(p) "Storage and Retrieval of Aerometric Data (SAROAD) system" is a computerized system which stores and reports information relating to ambient air quality.

(q) "SAROAD site identification form" is one of the several forms in the SAROAD system. It is the form which provides a complete description of the site (and its surroundings) of an ambient air quality monitoring station.

(r) "Urban area population" means the population defined in "1970 Census of Population; Supplementary Report: Population of Urbanized Areas Established Since the 1970 Census, for the United States; 1970," U.S. Bureau of Census, PC(S)-106, U.S. Government Printing Office, Washington, D.C., October, 1976.

[44 FR 27571, May 10, 1979, as amended at 46 FR 44163, Sept. 3, 1981]

§ 58.2 Purpose.

(a) This part contains criteria and requirements for ambient air quality monitoring and requirements for reporting ambient air quality data and information. The monitoring criteria pertain to the following areas:

(1) Quality assurance procedures for monitor operation and data handling.

(2) Methodology used in monitoring stations.

(3) Operating schedule.

(4) Siting parameters for instruments or instrument probes.

(b) The requirements pertaining to provisions for an air quality surveillance system in the State Implementation Plan are contained in this part.

(c) This part also acts to establish a national ambient air quality monitoring network for the purpose of providing timely air quality data upon which to base national assessments and policy decisions. This network will be operated by the States and will consist of certain selected stations from the States' SLAMS networks. These selected stations will remain as SLAMS and will continue to meet any applicable requirements on SLAMS. The stations, however, will also be designated as National Air Monitoring Stations (NAMS) and will be subject to additional data reporting and monitoring methodology requirements as contained in Subpart D of this part.

(d) Requirements for the daily reporting of an index of ambient air quality, to insure that the population of major urban areas are informed daily of local air quality conditions, are also included in this part.

§ 58.3 Applicability.

This part applies to:

(a) State air pollution control agencies.

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(b) Any local air pollution control agency or Indian governing body to which the State has delegated authority to operate a portion of the State's SLAMS network.

(c) Owners or operators of proposed sources.

Subpart B—Monitoring Criteria

§ 58.10 Quality assurance.

(a) Appendix A to this part contains quality assurance criteria to be followed when operating the SLAMS network.

(b) Appendix B to this part contains the quality assurance criteria to be followed by the owner or operator of a proposed source when operating a PSD station.

§ 58.11 Monitoring methods.

Appendix C to this part contains the criteria to be followed in determining acceptable monitoring methods or instruments for use in SLAMS.

§ 58.12 Siting of instruments or instrument probes.

Appendix E to this part contains criteria for siting instruments or instrument probes for SLAMS.

§ 58.13 Operating schedule.

Ambient air quality data collected at any SLAMS must be collected as follows:

(a) For continuous analyzers—consecutive hourly averages except during:

(1) Periods of routine maintenance,

(2) Periods of instrument calibration, or

(3) Periods or seasons exempted by the Regional Administrator.

(b) For manual methods—at least one 24-hour sample every six days except during periods or seasons exempted by the Regional Administrator.

§ 58.14 Special purpose monitors.

(a) Any ambient air quality monitoring station other than a SLAMS or PSD station from which the State intends to use the data as part of a demonstration of attainment or nonattainment or in computing a design value for control purposes of the National Ambient Air Quality Standards (NAAQS) must meet the requirements for SLAMS described in § 58.22 and, after January 1, 1983, must also meet the requirements for SLAMS as described in § 58.13 and Appendices A and E to this part.

(b) Any ambient air quality monitoring station other than a SLAMS or PSD station from which the State intends to use the data for SIP-related functions other than as described in paragraph (a) of this section is not necessarily required to comply with the requirements for a SLAMS station under paragraph (a) but must be operated in accordance with a monitoring schedule, methodology, quality assurance procedures, and probe or instrument-siting specifications approved by the Regional Administrator.

[46 FR 44164, Sept. 3, 1981]

Subpart C—State and Local Air Monitoring Stations (SLAMS)

§ 58.20 Air quality surveillance: Plan content.

By January 1, 1980, the State shall adopt and submit to the Administrator a revision to the plan which will:

(a) Provide for the establishment of an air quality surveillance system that consists of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) which measure ambient concentrations of those pollutants for which standards have been established in Part 50 of this chapter.

(b) Provide for meeting the requirements of Appendices A, C, D, and E to this part.

(c) Provide for the operation of at least one SLAMS per pollutant except Pb during any stage of an air pollution episode as defined in the contingency plan.

(d) Provide for the review of the air quality surveillance system on an annual basis to determine if the system meets the monitoring objectives defined in Appendix D to this part. Such review must identify needed modifications to the network such as termination or relocation of

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unnecessary stations or establishment of new stations which are necessary.

(e) Provide for having a SLAMS network description available for public inspection and submission to the Administrator upon request. The network description must be available at the time of plan revision submittal except for Pb which must be available by December 1, 1981 and must contain the following information for each SLAMS:

(1) The SAROAD site identification form for existing stations.

(2) The proposed location for scheduled stations.

(3) The sampling and analysis method.

(4) The operating schedule.

(5) The monitoring objective and spatial scale of representativeness as defined in Appendix D to this part.

(6) A schedule for: (i) Locating, placing into operation, and making available the SAROAD site identification form for each SLAMS which is not located and operating at the time of plan revision submittal, (ii) implementing quality assurance procedures of Appendix A to this part for each SLAMS for which such procedures are not implemented at the time of plan revision submittal, and (iii) resiting each SLAMS which does not meet the requirements of Appendix E to this part at the time of plan revision submittal.

[44 FR 27571, May 10, 1979, as amended at 46 FR 44164, Sept. 3, 1981]

§ 58.21 SLAMS network design.

The design criteria for SLAMS contained in Appendix D to this part must be used in designing the SLAMS network. The State shall consult with the Regional Administrator during the network design process. The final network design will be subject to the approval of the Regional Administrator.

§ 58.22 SLAMS methodology.

Each SLAMS must meet the monitoring methodology requirements of Appendix C to this part at the time the station is put into operation as a SLAMS.

§ 58.23 Monitoring network completion.

By January 1, 1983:

(a) Each station in the SLAMS network must be in operation, be sited in accordance with the criteria in Appendix E to this part, and be located as described on the station's SAROAD site identification form, and

(b) The quality assurance requirements of Appendix A to this part must be fully implemented.

§ 58.24 [Reserved]

§ 58.25 System modification.

The State shall annually develop and implement a schedule to modify the ambient air quality monitoring network to eliminate any unnecessary stations or to correct any inadequacies indicated by the result of the annual review required by § 58.20(d). The State shall consult with the Regional Administrator during the development of the schedule to modify the monitoring program. The final schedule and modifications will be subject to the approval of the Regional Administrator. Nothing in this section will preclude the State, with the approval of the Regional Administrator, from making modifications to the SLAMS network for reasons other than those resulting from the annual review.

§ 58.26 Annual SLAMS summary report.

(a) The State shall submit to the Administrator (through the appropriate Regional Office) an annual summary report of all the ambient air quality monitoring data from all monitoring stations designated State and Local Air Monitoring Stations (SLAMS). The annual report must be submitted by July 1 of each year for data collected from January 1 to December 31 of the previous year.

(b) The annual summary report must contain:

(1) The information specified in Appendix F,

(2) The annual precision and accuracy information described in Section 5.2 of Appendix A, and

(3) The location, date, pollution source, and duration of each incident of air pollution during which ambient levels of a pollutant reached or exceeded the level specified by § 51.16(a) of this chapter as a level which could

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cause significant harm to the health of persons.

(c) The senior air pollution control officer in the State or his designee shall certify that the annual summary report is accurate to the best of his knowledge.

§ 58.27 Compliance date for air quality data reporting.

The annual air quality data reporting requirements of § 58.26 apply to data collected after December 31, 1980. Data collected before January 1, 1981, must be reported under the reporting procedures in effect before the effective date of Subpart C of this part.

§ 58.28 Regional Office SLAMS data acquisition.

The State shall submit all or a portion of the SLAMS data to the Regional Administrator upon his request.

Subpart D—National Air Monitoring Stations (NAMS)

§ 58.30 NAMS network establishment.

(a) By January 1, 1980, with the exception of Pb, which shall be by December 1, 1981, the State shall:

(1) Establish, through the operation of stations or through a schedule for locating and placing stations into operation, that portion of a National Ambient Air Quality Monitoring Network which is in that State, and

(2) Submit to the Administrator (through the appropriate Regional Office) a description of that State's portion of the network.

(b) Hereinafter, the portion of the national network in any State will be referred to as the NAMS network.

(c) The stations in the NAMS network must be stations from the SLAMS network required by § 58.20.

(d) The requirements of Appendix D to this part must be met when designing the NAMS network. The process of designing the NAMS network must be part of the process of designing the SLAMS network as explained in Appendix D to this part.

[44 FR 27571, May 10, 1979, as amended at 46 FR 44164, Sept. 3, 1981]

§ 58.31 NAMS network description.

The NAMS network description required by § 58.30 must contain the following for all stations, existing or scheduled:

(a) The SAROAD site identification form for existing stations.

(b) The proposed location for scheduled stations.

(c) Identity of the urban area represented.

(d) The sampling and analysis method.

(e) The operating schedule.

(f) The monitoring objective and spatial scale of representativeness as defined in Appendix D to this part.

(g) A schedule for:

(1) Locating, placing into operation, and submitting the SAROAD site identification form for each NAMS which is not located and operating at the time of network description submittal,

(2) Implementing quality assurance procedures of Appendix A to this part for each NAMS for which such procedures are not implemented at the time of network description submittal, and

(3) Resiting each NAMS which does not meet the requirements of Appendix E to this part at the time of network description submittal.

§ 58.32 NAMS approval.

The NAMS network required by § 58.30 is subject to the approval of the Administrator. Such approval will be contingent upon completion of the network description as outlined in § 58.31 and upon conformance to the NAMS design criteria contained in Appendix D to this part.

§ 58.33 NAMS methodology.

Each NAMS must meet the monitoring methodology requirements of Appendix C to this part applicable to NAMS at the time the station is put into operation as a NAMS.

§ 58.34 NAMS network completion.

By January 1, 1981, with the exception of Pb, which shall be by July 1, 1982:

(a) Each NAMS must be in operation, be sited in accordance with the criteria in Appendix E to this part,

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and be located as described in the station's SAROAD site identification form; and

(b) The quality assurance requirements of Appendix A to this part must be fully implemented for all NAMS.

[44 FR 27571, May 10, 1979, as amended at 46 FR 44164, Sept. 3, 1981]

§ 58.35 NAMS data submittal.

(a) The requirements of this section apply only to those stations designated as NAMS by the network description required by § 58.30.

(b) The State shall report quarterly to the Administrator (through the appropriate Regional Office) all ambient air quality data and information specified by AEROS Users Manual (EPA-450/2-76-029, OAQPS No. 1.2-039) to be coded into the SAROAD Air Quality Data forms. Such air quality data and information must be submitted on either paper forms, punched cards, or magnetic tape in the format of the SAROAD Air Quality Data forms.

(c) The quarterly reporting periods are January 1-March 31, April 1-June 30, July 1-September 30, and October 1-December 31. The quarterly report must:

(1) Be submitted within 90 days of the end of each reporting period, and

(2) Contain all data and information gathered during the reporting period.

(d) For TSP, CO, SO_2, O_3, and NO_2, the first quarterly report will be due on or before June 30, 1981, for data collected during the first quarter of 1981. For Pb, the first quarterly report will be due on December 31, 1982, for data collected during the third quarter of 1982.

(e) Air quality data submitted in the quarterly report must have been edited and validated so that such data are ready to be entered into the SAROAD data files. Procedures for editing and validating data are described in AEROS Users Manual (EPA-450/2-76-029, OAQPS No. 1.2-039).

(f) This section does not permit a State to exempt those SLAMS which are also designated as NAMS from all or any of the reporting requirements applicable to SLAMS in § 58.26.

[44 FR 27571, May 10, 1979, as amended at 46 FR 44164, Sept. 3, 1981]

Subpart E—Air Quality Index Reporting

§ 58.40 Index reporting.

(a) The State shall report to the general public on a daily basis through prominent notice an air quality index in accordance with the requirements of Appendix G to this part.

(b) Reporting must commence by January 1, 1981, for all urban areas with a population exceeding 500,000, and by January 1, 1983, for all urban areas with a population exceeding 200,000.

(c) The population of urban areas for purposes of index reporting are as defined in "1970 Census of Population; Supplementary Report: Population of Urbanized Areas Established Since the 1970 Census, for the United States; 1970," U.S. Bureau of Census, PC(S)-106, U.S. Government Printing Office, Washington, D.C., October, 1976.

Subpart F—Federal Monitoring

§ 58.50 Federal monitoring.

The Administrator may locate and operate an ambient air monitoring station if the State fails to locate, or schedule to be located, during the initial network design process or as a result of the annual review required by § 58.20(d):

(a) A SLAMS at a site which is necessary in the judgment of the Regional Administrator to meet the objectives defined in Appendix D to this part, or

(b) A NAMS at a site which is necessary in the judgment of the Administrator for meeting EPA national data needs.

§ 58.51 Monitoring other pollutants.

The Administrator may promulgate criteria similar to that referenced in Subpart B of this part for monitoring a pollutant for which a National Ambient Air Quality Standard does not exist. Such an action would be taken whenever the Administrator determines that a nationwide monitoring

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program is necessary to monitor such a pollutant.

Appendix A—Quality Assurance Requirements For State and Local Air Monitoring Stations (SLAMS)

1. General Information

This Appendix specifies the minimum quality assurance requirements for SLAMS networks. These requirements are regarded as the minimum necessary for the control and assessment of the quality of the ambient air monitoring data submitted to EPA. States are encouraged to develop and implement quality assurance programs more extensive than the minimum required or to continue such programs where they already exist.

The quality assurance program specified herein must be fully implemented by the dates specified in § 58.23 and § 58.34(b). Earlier implementation is encouraged.

Quality Assurance consists of two distinct and equally important functions. One function is the assessment of the quality of the monitoring data by estimating their precision and accuracy. The other function is the control, and improvement, of the quality of the monitoring data by implementation of quality control policies, procedures, and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable.

In order to provide uniformity in the assessment and reporting of data quality among all SLAMS networks, the assessment procedures are specified explicitly in sections 3, 4, and 5 of this Appendix.

In contrast, the control and corrective action function encompasses a variety of policies, procedures, specifications, standards, and corrective measures which have varying effects on the resulting data quality. The selection and degree of specific control measures and corrective actions used depend on a number of factors such as the monitoring methods and equipment used, field and laboratory conditions, the objectives of the monitoring, the level of the data quality needed, the expertise of assigned personnel, the cost of control procedures, pollutant concentration levels, etc. Accordingly, quality control requirements are specified in general terms, in section 2 of this Appendix, to allow each State to develop a quality control system which is most effective for its own circumstances.

2. Quality Control Requirements

2.1 Each State must develop and implement a quality control program consisting of policies, procedures, specifications, standards, and documentation necessary to:

(1) Provide data of adequate quality to meet monitoring objectives.

(2) Minimize loss of air quality data due to malfunctions or out-or-control conditions.

The quality control program must be described in detail, suitably documented, and approved by the Regional Administrator or his designee. The quality control program will be reviewed during the annual system audit described in section 2.4

2.2 Primary guidance for developing the quality control programs is contained in references 1 and 2, which also contain many suggested procedures, checks, and control specifications. Section 2.09 of Reference 2 describes specific guidance for the development of a quality control program for SLAMS automated analyzers and manual methods. Many specific quality control checks and specifications for manual methods are included in the respective reference methods described in Part 50 of this chapter or in the respective equivalent method descriptions available from EPA (see reference 5). Similarly, quality control procedures related to specifically designated reference and equivalent analyzers are contained in their respective operation and instruction manuals. This guidance, and any other pertinent information from appropriate sources, should be used by the States in developing their quality control programs.

As a minimum, each quality control program must have operational procedures for each of the following activities:

(1) Selection of methods, analyzers, or samplers.

(2) Installation of equipment.

(3) Calibration.

(4) Zero/span checks and adjustments of automated analyzers.

(5) Control checks and their frequency.

(6) Control limits for zero, span and other control checks, and respective corrective actions when such limits are surpassed.

(7) Calibration and zero/span checks for multiple range analyzers (see section 2.6 of Appendix C of this part).

(8) Preventive and remedial maintenance.

(9) Quality control procedures for air pollution episode monitoring.

(10) Recording and validating data.

(11) Documentation of quality control information.

2.3 *Pollutant Standards.*

2.3.1 Gaseous standards (permeation tubes, permeation devices or cylinders of compressed gas) used to obtain test concentrations for CO, SO_2, and NO_2 must be working standards certified by comparison to a National Bureau of Standards (NBS) gaseous Standard Reference Material (SRM). A traceability protocol for certifying a working standard by direct comparison to an

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NBS SRM is given in reference 3. Direct use of an NBS SRM as a working standard is not prohibited but is discouraged because of their limited supply and expense.

2.3.2 Test concentrations for ozone must be obtained in accordance with the UV photometric calibration procedure specified in Appendix D of Part 50 of this chapter, or by means of an ozone transfer standard which has been certified. Consult reference 4 for guidance on ozone transfer standards.

2.3.3 Flow measurements must be made by a flow measuring instrument which is traceable to an authoritative volume or other standard.

2.4 National Performance and System Audit Programs

Agencies operating all or a portion of a SLAMS network are required to participate in EPA's national performance audit program and to permit an annual EPA system audit of their ambient air monitoring program. See section 1.4.16 of reference 1 and reference 6 for additional information about these programs. Agencies should contact either the appropriate EPA Regional Quality Control Coordinator or the Quality Assurance Branch, EMSL/RTP, at the address given in reference 3 for instructions for participation.

3. Data Quality Assessment Requirements

Data quality is measured (below), specified (section 4), and reported (section 5) on the basis of "reporting organizations." A reporting organization is defined as a State or subordinate organization within a State which is responsible for a set of stations which monitor the same pollutant and for which precision and accuracy assessments can be pooled. States must define one or more reporting organizations for each pollutant such that each monitoring station in the State SLAMS network is included in one, and only one, reporting organization.

Each reporting organization shall be defined such that precision and accuracy among all stations in the organization can be expected to be reasonably homogeneous, as a result of common factors. Common factors which should be considered by States in defining reporting organizations include: (1) Operation by a common team of field operators, (2) common calibration facilities, and (3) support by a common laboratory or headquarters. Where there is uncertainty in defining the reporting organizations or in assigning specific sites to reporting organizations, States must consult with the appropriate EPA Regional Office for guidance.

3.1 *Automated Methods.*

3.1.1 *Precision.* A one-point precision check must be carried out at least once every two weeks on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.08 and 0.10 ppm for SO_2, NO_2, and O_3 analyzers, and between 8 and 10 ppm for CO analyzers. To check the precision of SLAMS analyzers operating on ranges higher than 0 to 1.0 ppm for SO_2, NO_2, and O_3, or 0 to 100 ppm for CO, use precision check gases of appropriately higher concentration as approved by the Regional Administrator or his designee. The results of precision checks at concentration levels other than those shown above need not be reported to EMSL/RTP. The standards from which precision check test concentrations are obtained must meet the specifications of section 2.3. Except for certain CO analyzers described below, analyzers must operate in their normal sampling mode during the precision check, and the test atmosphere must pass through all filters, scrubbers, conditioners and other components used during normal ambient sampling and as much of the ambient air inlet system as is practicable. If permitted by the associated operation or instruction manual, a CO analyzer may be temporarily modified during the precision check to reduce vent or purge flows, or the test atmosphere may enter the analyzer at a point other than the normal sample inlet, *provided that* the analyzer's response is not likely to be altered by these deviations from the normal operational mode. If a precision check is made in conjunction with a zero/span adjustment, it must be made prior to such zero and span adjustments.

The difference between the actual concentration of the precision check gas and the concentration indicated by the analyzer is used to assess the precision of the monitoring data as described in section 4.1.1. Report data only from automated analyzers that are approved for use in the SLAMS network.

3.1.2 *Accuracy.* Each calendar quarter audit at least 25 percent of the SLAMS analyzers that monitor for SO_2, NO_2, O_3 or CO such that each analyzer is audited at least once per year. If there are fewer than four analyzers for a pollutant within a reporting organization, randomly reaudit one or more analyzers so that at least one analyzer for that pollutant is audited each calendar quarter.

The audit is made by challenging the analyzer with at least one audit gas of known concentration from each of the following ranges which fall within the measurement range of the analyzer being audited:

Audit point	Concentration range, ppm	
	SO_2, NO_2, O_3	CO
1	0.03–0.08	3–8
2	0.15–0.20	15–20

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Audit point	Concentration range, ppm	
	SO_2, NO_2, O_3	CO
3	0.35–0.45	35–45
4	0.80–0.90	80–90

To audit SLAMS analyzers operating on ranges higher than 0 to 1.0 ppm for SO_2, NO_2, and O_3 or 0 to 100 ppm for CO, use audit gases of appropriately higher concentration as approved by the Regional Administrator or his designee. The results of audits at concentration levels other than those shown in the above table need not be reported to EMSL/RTP.

The standards from which audit gas test concentrations are obtained must meet the specifications of section 2.3. Working or transfer standards and equipment used for auditing must be different from the standards and equipment used for calibration and spanning. The auditing standards and calibration standards may be referenced to the same NBS SRM or primary UV photometer. The auditor should not be the operator/analyst who conducts the routine monitoring, calibration, and analysis.

The audit shall be carried out by allowing the analyzer to analyze an audit test atmosphere in the same manner as described for precision checks in section 3.1.1. The excepting given in section 3.1.1 for certain CO analyzers does not apply for audits.

The difference between the actual concentration of the audit test gas and the concentration indicated by the analyzer is used to assess the accuracy of the monitoring data as described in section 4.1.2. Report data only from automated analyzers that are approved for use in the SLAMS network.

3.2 *Manual Methods.*

3.2.1 *Precision.* Within each reporting organization, select at least two sites for duplicate sampling and collocate two samplers at each selected site. Although only two pairs of collocated samplers are required to estimate the precision of a reporting organization, additional collocated sampling is encouraged. Sites with the highest expected geometric mean concentration must be selected or, if such sites are impractical, alternate sites approved by the Regional Administrator may be selected. The two samplers must be within 4 meters of each other, and high-volume samplers must be at least 2 meters apart to preclude airflow interference. Calibration, sampling and analysis must be the same for both collocated samplers as well as for all other samplers in the network. The collocated samplers must be operated concurrently with the routine sampler at least once a week. For each pair of collocated samplers, designate one as the sampler which will be used to report air quality for the site and designate the other as the duplicate sampler. The differences in measured concentration ($\mu g/m^3$) between the two collocated samplers are used to calculate precision as described in section 4.2.1.

For the Pb reference method, precision will be estimated from duplicate filter strip analyses performed on samples from the expected highest concentration lead site. The precision of an equivalent lead method may be assessed by analyzing identical aliquots of the samples collected at the expected highest concentration lead site. For each day lead samples are collected, cut two identical strips from the filter or take two identical aliquots. Designate the first strip/aliquot as the sample which will be used to report air quality for the site and designate the other as the duplicate sample. The difference in measured concentration ($\mu g/m^3$) between the two samples is used to calculate precision as described in 4.2.1.

3.2.2 *Accuracy.* The accuracy of manual sampling methods is assessed by auditing a portion of the measurement process. For TSP, the flow rate during sample collection is audited. For Pb, the flow rate and analytical measurement are audited. The flow audit should be scheduled so as to avoid interference with a scheduled sampling period. For SO_2 and NO_2 methods, the analytical measurement is audited.

(a) *TSP Method.* (Appendix B of Part 50 of this chapter). Each calendar quarter, audit the flow rate of at least 25 percent of the high-volume samplers such that each sampler is audited at least once per year. If there are fewer than four high-volume samplers within a reporting organization, randomly reaudit one or more samplers so that one sampler is audited each calendar quarter.

Audit the flow rate at one flow rate using a reference flow device described in section 2.2.8, pages 3-5, of reference 2, or a similar transfer flow standard. The device used for auditing must be different from the one used to calibrate the flow of the high-volume sample being audited. The auditing device and the calibration device may both be referenced to the same primary flow standard. With the audit device in place, operate the high-volume sampler at its normal flow rate. The difference in flow rate (in m^3/min) between the audit flow measurement and the flow indicated by the sampler's normal flow indicator are used to calculate accuracy as described in section 4.2.2.

Great care must be used in auditing high-volume samplers having flow regulators because the introduction of resistance plates in the audit device can cause abnormal flow patterns at the point of flow sensing. For this reason, the orifice of the flow audit device should be used with a normal glass fiber filter in place and without resistance

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plates in auditing flow regulated high-volume samplers, or other steps should be taken to assure that flow patterns are not perturbed at the point of flow sensing.

(b) *SO_2 Methods.* Prepare audit solutions from a working sulfite-TCM solution as described in section 6.2.9 of the SO_2 Reference Method (40 CFR, Part 50, Appendix A). These audit samples must be prepared independently from the standardized sulfite solutions used in the routine analysis procedure. New sulfite-TCM audit samples must be prepared every 30 days and must be stored between 0 and 5°C.

Prepare audit bamples in each of the concentration ranges of 0.2–0.3, 0.5–0.6, and 0.8–0.9 μg SO_2/ml. Analyze an audit sample in each of the three ranges at least once each day that samples are analyzed and at least twice per calendar quarter. The differences between the audit concentrations (in μg SO_2/ml) and the indicated concentrations (in μg SO_2/ml) are used to calculate accuracy as described in section 4.2.2.

(c) *NO_2 Methods.* Prepare audit solutions from a working sodium nitrite solution as described in the appropriate equivalent method (see reference 5). These audit samples must be prepared independently from the standardized nitrate solution used in the routine analysis procedure. New aqueous sodium nitrate audit samples must be prepared every three months. Prepare audit samples in each of the concentration ranges of 0.2–0.3, 0.5–0.6, and 0.8–0.9 μg NO_2/ml. Analyze an audit sample in each of the three ranges at least once each day that samples are analyzed and at least twice per calendar quarter. The differences between the audit concentrations (in μg NO_2/ml) and the indicated concentrations (in μg NO_2/ml) are used to calculate accuracy as described in section 4.2.2.

(d) *Pb Methods.* For the reference method (Appendix G of Part 50 of this chapter) the flow rates of the high volume Pb samplers are to be audited as part of the TSP network using the same procedures described in 3.2.2(a) above. For agencies operating both TSP and Pb networks, 25 percent of the total number of high volume samplers are to be audited each quarter.

Each calendar quarter, audit the Pb reference method analyses using glass fiber filter strips containing a known quantity of Pb. Audit samples are prepared by depositing a lead solution on 1.9 cm by 20.3 cm (¾ inch by 8 inch) unexposed glass fiber filter strips, and allowing to dry thoroughly. The audit samples must be prepared using reagents different from those used to calibrate the lead analytical equipment being audited. Prepare audit samples in the following concentration ranges:

Range	Pb concentration μg/strip	Equivalent ambient Pb concentration[1] μg/m³
1	100–300	0.5–1.5
2	600–1000	3.0–5.0

[1] Equivalent ambient Pb concentration in μg/m³ is based on sampling at 1.7 m³/min for 24 hours on 20.3 cm × 25.4 cm (8 inch × 10 inch) glass fiber filter.

Audit samples must be extracted using the same extraction procedure used for exposed filters.

Analyze three audit samples in each of the two ranges each quarter samples are analyzed. The audit sample analyses are to be spread out as much as possible over the entire calendar quarter. The percent difference between the audit concentration (in μg Pb/strip) and the analyst's measured concentration (in μg Pb/strip) is used to calculate analysis accuracy as described in section 4.2.2.

The accuracy of an equivalent method is assessed in the same manner as the reference method. The flow auditing device and Pb analysis audit samples must be compatible with the specific requirements of the equivalent method.

4. Calculations for Data Quality Assessment

4.1 *Automated Methods.*

4.1.1 *Precision.* Estimates of the precision are calculated from the results of biweekly precision checks as specified in section 3.1.1. At the end of each calendar quarter calculate a combined precision probability interval for all SLAMS analyzers in the reporting organization for each pollutant. Directions for calculations are given below and directions for reporting are given in section 5. DO NOT include results from non-approved analyzers in the calculation of precision estimates. If monitoring data is invalidated during the entire period represented by a given precision check, the results of that precision check shall be excluded from the calculations.

(a) *Single Analyzer Precision.*

Calculate the percentage difference (d_i) for each precision check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \qquad (1)$$

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where:

Y_i = analyzer's indicated concentration from the i-th precision check.

X_i = known concentration of test gas used for the i-th precision check.

For each instrument, calculate the quarterly average (d_j), equation 2, and the standard deviation (S_j), equation 3.

$$\bar{d}_j = \frac{1}{n}\sum_{i=1}^{n} d_i \quad (2)$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_{i=1}^{n} d_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} d_i\right)^2\right]} \quad (3)$$

where n is the number of precision checks on the instrument made during the calendar quarter. For example, n should be 6 or 7 if precision checks are made biweekly during a quarter.

(b) *Precision for Reporting Organization.* For each pollutant, calculate the average of averages (D) and pooled standard deviation (S_a) for all analyzers monitoring the pollutant using either equations 4 and 5 or 4a and 5a.

$$D = \frac{1}{k}\sum_{j=1}^{k} \bar{d}_j \quad (4)$$

$$S_a = \sqrt{\frac{1}{k}\sum_{j=1}^{k} S_j^2} \quad (5),$$

where k is the number of analyzers within the reporting organization for a single pollutant. Use equations 4 and 5 when the same number of precision checks are made for each instrument. Otherwise, use equations 4a and 5a to obtain a weighted average and a weighted standard deviation.

$$S_a = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2 + \ldots + (n-1)S_j^2 + \ldots + (n_k-1)S_k^2}{n_1 + n_2 + \ldots + n_j + \ldots + n_k - k}} \quad (5a)$$

For each pollutant, calculate the 95 Percent Probability Limits for the precision of a reporting organization using equations 6 and 7 and record these limits on the front of Form 1 (Figure 1) under columns 22-27. (See section 5 for explanation of Form 1).

Upper 95 Percent Probability Limit = $D + 1.96\ S_a$. (6)

Lower 95 Percent Probability Limit = $D - 1.96\ S_a$. (7)

4.1.2 *Accuracy.* Estimates of the accuracy are calculated from the results of independent audits as described in section 3.1.2. At the end of each calendar quarter calculate a combined accuracy probability interval for all SLAMS analyzers in the reporting organization for each pollutant. Separate probability limits are calculated for each audit concentration level listed in section 3.1.2. Directions for calculations are given below (directions for reporting are given in section 5). DO NOT include results from nonapproved analyzers in the calculation.

(a) *Single Analyzer Accuracy.* Calculate the percentage difference (d_i) for each audit concentration using equation 1 where Y_i is the analyzer's indicated concentration from the i-th audit check and X_i is the known concentration of the audit gas used for the i-th audit check.

(b) *Accuracy for Reporting Organization.* Using equation 8, calculate, for each audit concentration level, the average (D) of the individual percentage differences (d_i) for all k analyzers measuring a given pollutant audited during the quarter.

$$D = \frac{1}{k}\sum_{i=1}^{k} d_i \quad (8)$$

For each concentration level, calculate the standard deviation (S_a) of all the individual percentage differences for all analyzers audited during the quarter, using equation 9. Repeat for each pollutant.

$$S_a = \sqrt{\frac{1}{k-1}\left[\sum_{i=1}^{k} d_i^2 - \frac{1}{k}\left(\sum_{i=1}^{k} d_i\right)^2\right]} \quad (9)$$

For reporting organizations having four or fewer analyzers for a particular pollutant, only one audit is required each quarter. Therefore, the average and standard deviation cannot be calculated. For such reporting units, the audit results of two consecutive quarters are required to calculate an average and a standard deviation using equations 8 and 9, and the reporting of probability limits are therefore required on a semi-annual (instead of a quarterly) basis. For each pollutant, calculate the 95 Percent

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Probability Limits for the accuracy of a reporting organization at each audit concentration level using equations 6 and 7 and record these limits on the front of Form 1 (Figure 1) under columns 39–62. (See section 5 for explanation of Form 1).

4.2 *Manual Methods.*

4.2.1 *Precision.* Estimates of precision are calculated from the results obtained from collocation of two samplers or from the analyses of duplicate strips/aliquots as described in section 3.2.1. At the end of each calendar quarter, calculate a combined precision probability interval for all collocated samplers for each pollutant. Directions for calculation are given below and directions for reporting are given in section 5.

(a) *Single Instrument Precision.* For each of the paired measurements described in section 3.2.1, calculate the percentage difference (d_i) using equation 1 where Y_i is the concentration of pollutant measured by the duplicate sampler and X_i is the concentration of pollutant measured by the sampler reporting air quality for the site. For each site, calculate the quarterly average percentage difference (d_j), equation 2, and the standard deviation (S_j), equation 3.

At low concentrations, agreement between the measurements of collocated samplers, expressed as 95 Percent Probability Limits, may be poor. For this reason a separate count is made of the occurrence of pollutant measurements below specified levels. Count the number of samples from all collocated sites which indicate a measurement from a sampler reporting air quality for the site (See section 3.2.1) below the following limits:

TSP less than 20 $\mu g/m^3$
SO_2 less than 40 $\mu g/m^3$
NO_2 less than 30 $\mu g/m^3$
Pb less than 0.15 $\mu g/m^3$

Report the counts on columns 20–23 of Form 1 (Back).

(b) *Precision for Reporting Organization.* For each pollutant, calculate the average percentage difference (D) and pooled standard deviation (S_a) using equations 4 and 5, or using equations 4a and 5a if different numbers of paired measurements are made at the collocated sites. For these calculations, the k of equations 4, 5, 4a and 5a is the number of samplers at collocated sites designated to report air quality. Results from all collocated sampling sites shall be reported.

Calculate the 95 Percent Probability Limits for the precision of a reporting unit, using equations 10 and 11, and record them in columns 24–29 on the back of Form 1 (See section 5 for explanation of Form 1).

$$\text{Upper 95 Percent Probability Limit} = D + 1.96\, S_a/\sqrt{2} \quad (10)$$

$$\text{Lower 95 Percent Probability Limit} = D - 1.96\, S_a/\sqrt{2} \quad (11)$$

4.2.2 *Accuracy.*

(a) *Single Sampler Accuracy (TSP).* For the flow rate audit described in section 3.2.2(a), let X_i represent the known flow rate and Y_i represent the indicated flow rate. Calculate the percentage difference (d_i) for each audit using equation 1.

(b) *Accuracy for Reporting Organization (TSP).* Using equation 8 calculate the average (D) of the individual percent differences for all high-volume samplers audited during the calendar quarter. Compute the standard deviation (S_a) of all the percentage differences for all of the instruments audited during the calendar quarter using equation 9.

Calculate the 95 Percent Probability Limits for the accuracy of a reporting organization using equations 6 and 7, and record these limits on the back of Form 1 under columns 46–51. Note that since the audit is conducted at only one level, columns 40–45 and 52–57 are not used. For reporting organizations having four or fewer high-volume samplers for TSP, only one audit is required each quarter. For such reporting organizations, the audit results of two consecutive quarters are required to calculate an average and a standard deviation using equations 8 and 9. Therefore, semi-annual reporting (instead of quarterly) of probability limits is required.

(c) *Single-Analysis-Day Accuracy (SO_2, NO_2, and Pb).* For each of the audits of the analyses for SO_2, NO_2 and Pb described in section 3.2.2(b), (c), and (d) let X_i represent the known value of the audit sample and Y_i the indicated value of SO_2, NO_2, and Pb. Calculate the percentage difference (d_i) for each audit at each concentration level using equation 1.

(d) *Accuracy for Reporting Organization (SO_2 and NO_2).* Calculate the average (D) of the percent differences at each concentration level for all analysis days during the quarter using equation 8. Compute the standard deviation (S_a) of the individual percentage differences using equation 9. Calculate the 95 Percent Probability Limits for the accuracy for the reporting organization using equations 6 and 7 and record these limits on the back of Form 1 for each concentration level under columns 40–57. Calculate the 95 Percent Probability Limits for the accuracy for the reporting organization using equations 6 and 7 and record these limits on the back of Form 1 for each concentration level under columns 40–57 for SO_2 and NO_2, and under columns 40–45 and 46–51 for the Range 1 and Range 2 Pb concentrations, respectively.

(e) *Single Sampler Accuracy (Pb).* For high-volume samplers, flow audit calculations and reporting audit results are included with the TSP determinations as described in section 4.2.2(a) and (b) above. The

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remainder of paragraphs (e) and (f) apply to equivalent methods which do not use the high-volume sampler.

For the flow rate audit described in section 3.2.2(d), let X_i represent the known flow rate and Y_i represent the indicated flow rate. Calculate the percentage difference (d_i) for each audit using equation 1.

(f) *Sampling Accuracy for Reporting Organization (Non-High Volume Sampler Pb Methods).* Using equation 8, calculate the average ($\overline{D}$) of the individual percent differences for all samplers audited during the calendar quarter. Compute the standard deviation (S_d) of all the percentage differences for all of the instruments audited during the calendar quarter using equation 9.

Calculate the 95 Percentage Probability Limits for the accuracy of a reporting organization using equations 6 and 7, and record these limits on the back of Form 1 under columns 52-57. Note that since the audit is conducted at only one level, columns 40-45 and 46-51 are not used for reporting accuracy during sampling; however, these columns will be used for reporting accuracy during analyses as described in (d). For reporting organizations having four or fewer samplers for Pb, which will be the usual case, only one audit is required each quarter. For such reporting organizations, the audit results of two consecutive quarters are required to calculate an average and a standard deviation using equations 8 and 9. Therefore, semi-annual reporting (instead of quarterly) of probability limits is required.

5. Reporting Requirements

For each pollutant, prepare a list of all monitoring sites and their SAROAD site identification codes in each reporting organization and submit the list to the Regional Office, with a copy to Environmental Monitoring and Support Laboratory (MD-75), U.S. Environmental Protection Agency, Research Triangle Park, NC 27711 (EMSL/RTP). Whenever there is a change in the assignment of a monitoring site in a reporting organization, report this change to the Regional Office and to EMSL/RTP.

5.1 *Quarterly Reports.*

For each reporting organization fill out form 1 (Front) and (Back) according to the directions given below, and submit the form within 90 days of the end of the quarter to the appropriate Regional Office, with a copy to EMSL/RTP.

5.2 *Annual Reports.*

Compute simple unweighted arithmetic averages of the probability limits for precision and accuracy from the four quarterly periods of the calendar year and report them with the annual SLAMS report required by 58.26. Also include in the SLAMS annual report a listing by pollutant, of the monitoring sites in each reporting organization within the state.

5.3 *Instructions for Form 1.*

[General information (Form 1, Front and Back)]

Block No.	Description
1-2	*SAROAD State:* The two digit SAROAD State code.
3-5	*Reporting Organization:* A unique 3-digit code assigned by each State to each of its respective reporting organizations.
6-7	*Year:* Last two digits of the calendar year.
8	*Quarter:* for SLAMS/NAMS Quarterly Report: Enter 1, 2, 3 or 4 to refer to calendar quarter the monitoring data and quality assessments were made. For SLAMS *Annual* Report: Enter 0 to indicate annual SLAMS report.
	Automated Analyzers (Form 1, Front)
9-14	*Pollutant Identifiers:* Precoded.
28-33	(Rows labeled "E" are available for future additional pollutants.)
15-17	*Number of Analyzers:* Count only the number of approved analyzers in the network that report monitoring data for each pollutant.
18-21	*Number of Precision Checks:* Count the total number of precision checks included in the calculations reported.
22-24	*Lower Probability Limit, Precision:* Block 22 is either "+" or "−". Blocks 22-24 contain the percentage (round off to a whole number) obtained from equation 7.
25-27	*Upper Probability Limit, Precision:* Block 25 is either "+" or "−". Blocks 26-27 contain the percentage obtained from equation 6. Note: If precision limits exceed two digits, e.g., 103% report as *99*.
34	*Traceability:* If audit gases were traced to NBS by the reporting organization, put 1 in block 34. If audit gases were traced to NBS by someone outside the reporting organization, put 2 in block 34.
35	*Source of Local Primary Standard:* For accuracy determination, refer to code listed in Note 2.
36-38	*Number of Audits:* Report the total number of multipoint audits performed on the analyzers.

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[General information (Form 1, Front and Back)]

Block No.	Description
39–62	*Probability Limits, Accuracy:* The lower and upper probability limits for each pollutant concentration level of the accuracy audits are entered in blocks 39–62. Levels, their corresponding concentration ranges for each pollutant and the appropriate blocks for this information are given in the following table.
63–65	*Number of Audits at Level 4:* Report the total number of audits performed at level 4.

Blocks	Levels	Pollutant concentration ranges, ppm	
		NO_2, O_3, SO_2	CO
39–44	1	.03 to .08	3 to 8.
45–50	2	.15 to .20	15 to 20.
51–56	3	.40 to .45	40 to 45.
57–62	4	.80 to .90	80 to 90.

Block No.	Description
39–41, 45–47, 51–53, 57–59	*Lower Probability Limits, Accuracy:* Blocks 39, 45, 51 and 57 are either "+" or "−". Blocks 40–41, 46–47, 52–53 and 56–57 contain the percentages obtained from equation 7.
42–44, 48–50, 54–56, 60–62	*Upper Probability Limit, Accuracy:* Blocks 42, 48, 54 and 60 are either "+" or "−". Blocks 43–44, 49–50, 55–56 and 61–62 contain the percentage obtained from equation 6. NOTE: If only one audit is performed during a given quarter for a given pollutant, it is not possible to calculate probability limits for that quarter. In that case, blocks 39–62 are left blank for the first such quarter and the number 001 is reported in blocks 36–38. Probability limits are then computed and reported on a semi-annual basis (i.e., after the next quarter) from the audit data obtained during the two consecutive quarters.

Manual Methods (Form 1, Back)

9–14	*Pollutant Identifiers:* Precoded.
30–35	(Rows labeled "D" are available for future additional pollutants.)
15–17	*Number of Samplers:* Count only the number of samplers for each pollutant that is associated with an approved method and from which monitoring data are reported as part of a SLAMS network.
18–19	*Number of Collocated Sites:* Number of sites having collocated samplers. The minimum number is 2.
20–23	*Number of Collocated samples below the limit:* Count the number of samples from the collocated sites where the measurements from sampler reporting air quality for the site (see section 3.2.1) are below the following limits: TSP–20μg TSP/m^3 SO_2–40μg SO_2/m^3 NO_2–30μg NO_2/m^3 Pb–0.15μg Pb/m^3
24–26	*Lower Probability Limit, Precision:* Block 24 is either "+" or "−". Blocks 25–26 contain the percentage obtained from equation 11.
27–29	*Upper Probability Limit, Precision:* Block 27 is either "+" or "−". Blocks 28–29 contain the percentage obtained from equation 10. Note: If precision limits exceed two digits, e.g., 103%, report as 99.
36	Not applicable
37–39	*Number of Audits:* Count the total number of audits performed on the *entire network* for the pollutants. A single audit may consist of several audit level checks, but count only once for each audit. For example, although an audit conducted for NO_2 or SO_2 consists of checks at three different concentration levels, count this as one audit, not three.
40–57	*Probability Limits, Accuracy:* The lower and upper probability limits for each level of the accuracy audits are entered in blocks 40–57. Levels, their corresponding concentration ranges and the appropriate blocks for this information are given in the following table:

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Blocks	Levels	TSP cfm	Pb cfm	Audit concentrations	
				Pb μg/strip[1]	SO_2, NO_2, μg/ml
40–45	1			100 to 300	0.2 to 0.3.
46–51	2	One within 40–60 cfm..		600 to 1,000	0.5 to 0.6.
52–57	3		(3)		0.8 to 0.9.
58–60			(3)	(3)	(3)

[1]Audit ranges apply only to the Pb reference method. Audit ranges for an equivalent Pb method must be compatible with the specific requirements of the equivalent method.
[2]Flow audit of equivalent method should be in normal operating range of the sampler.
[3]*Number of Valid Collocated Data Pairs:* Enter the total number of data pairs from all the collocated sites.

Block No.	Description
40–42, 46–48, 52–54	*Lower Probability Limits, Accuracy:* Blocks 40, 46 and 52 are either "+" or "−". Blocks 41–42, 47–48 and 53–54 contain the percentage obtained from equation 7.
43–45, 49–51, 55–57	*Upper Probability . imits, Accuracy:* Blocks 43, 49 and 55 are either "+" or "−". Blocks 44–45, 50–51 and 56–57 contain the percentage obtained from equation 6. Note: If accuracy limits exceed two digits, e.g., 103%, report as *99*. Report, as required, all pollutants (TSP, SO_2 and NO_2) as determined by manual sampling methods. Note that only blocks 46–51 are used for TSP. NOTE: If only one audit is performed during a given quarter for a given pollutant, it is not possible to calculate probability limits for that quarter. In that case, blocks 40–57 are left blank for the first such quarter and the number 001 is reported in blocks 37–39. Probability limits are then computed and reported on a semi-annual basis (i.e., after the next quarter) from the audit data obtained during the two consecutive quarters.

References

1. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I—Principles." EPA-600/9-76-005. March 1976. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, N.C. 27711.

2. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II—Ambient Air Specific Methods." EPA-600/4-77-027a, May 1977. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, N.C. 27711.

3. "Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Air Pollution Analyzers," (Protocol No. 2), June 1978. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch, (MD-77), Research Triangle Park, N.C. 27711.

4. "Transfer Standards for Calibration of Ambient Air Monitoring Analyzers for Ozone," June 1978. Available from U.S. Environmental Protection Agency, Department E (MD-77), Research Triangle Park, N.C. 27711.

5. "List of Reference and Equivalent Methods." Available from U.S. Environmental Protection Agency, Department E (MD-77), Research Triangle Park, N.C. 27711.

6. "Criteria, Procedures and Forms for the Evaluation of Ambient Air Monitoring Programs—Laboratory and Field," June 1979. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD-77), Research Triangle Park, N.C. 27711.

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DATA ASSESSMENT REPORT

OMB No. 158-R0012
Expires

STATE | REPORTING ORGANIZATION | YEAR | QUARTER | SEND COMPLETED FORM TO REGIONAL OFFICE WITH COPY TO EMSL/RTP

1 2 3 4 5 | 6 7 | 8

NAME OF REPORTING ORGANIZATION _____

AUTOMATED ANALYZERS

PRECISION

		NO OF ANALYZERS [1]	NO OF PRECISION CHECKS	PROBABILITY LIMITS LOWER	PROBABILITY LIMITS UPPER
A	CO	9 10	15 17	18 21	22 27
B	NO_2	9 10	15 17	18 21	22 27
C	O_3	9 10	15 17	18 21	22 27
D	SO_2	9 10	15 17	18 21	22 27
E	___	9 10	15 17	18 21	22 27

ACCURACY

		TRACEABILITY	SOURCE OF LOCAL PRIMARY STANDARD [2]	NO OF AUDITS	PROBABILITY LIMITS LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	NO OF AUDITS AT LEVEL 4
A	CO	28 33	35	36 38	39 44	45 50	51 56	57 62	63 65
B	NO_2	28 33	35	36 38	39 44	45 50	51 56	57 62	63 65
C	O_3	28 33	35	36 38	39 44	45 50	51 56	57 62	63 65
D	SO_2	28 33	35	36 38	39 44	45 50	51 56	57 62	63 65
E	___	28 33	35	36 38	39 44	45 50	51 56	57 62	63 65

[1] COUNT ONLY REFERENCE OR EQUIVALENT MONITORING METHODS

[2] Identify according to the following code

A NBS SRM
B EMSL REFERENCE GAS
C VENDER CRM
D PHOTOMETER
E BAM
F OTHER SPECIFY _____

FIGURE 1 FORM 1 (FRONT)

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DATA ASSESSMENT REPORT

OMB No. 158-R0012
Expires

STATE | REPORTING ORGANIZATION | YEAR | QUARTER | SEND COMPLETED FORM TO REGIONAL OFFICE WITH COPY TO EMSL/RTP

1 2 | 3 4 5 | 6 7 | 8

NAME OF REPORTING ORGANIZATION _____

MANUAL METHODS

PRECISION

		NO OF SAMPLERS [1]	NO OF COLLOCATED SITES	NO OF COLLOCATED SAMPLES ≤ LIMIT	PROBABILITY LIMITS LOWER	PROBABILITY LIMITS UPPER	LIMITS APPLICABLE TO BLOCKS 20-23	NO OF VALID COLLOCATED DATA PAIRS
A TSP	1 1 1 1 0 1 (9-14)	(15-17)	(18-19)	(20-23)	+/- (24-29)	+/-	TSP 20 μg TSP/m³	(58-60)
B SO_2	1 4 2 4 0 1 (9-14)	(15-17)	(18-19)	(20-23)	+/- (24-29)	+/-	SO_2 40 μg SO_2/m³	(58-60)
C NO_2	1 4 2 6 0 2 (9-14)	(15-17)	(18-19)	(20-23)	+/- (24-29)	+/-	NO_2 30 μg NO_2/m³	(58-60)
D Pb	1 1 2 1 2 8 (9-14)	(15-17)	(18-19)	(20-21)	+/- (24-29)	+/-	Pb 0.15 μg Pb/m³	(58-60)

ACCURACY

			NO OF AUDITS	LEVEL 1 LOWER	LEVEL 1 UPPER	LEVEL 2 LOWER	LEVEL 2 UPPER	LEVEL 3 LOWER	LEVEL 3 UPPER
A TSP	1 1 1 1 0 1 (30-35)	A (36)	(37-39)	+/- (40-45)	+/-	+/- (46-51)	+/-	+/- (52-57)	+/-
B SO_2	1 4 2 4 0 1 (30-35)	B (36)	(37-39)	+/- (40-45)	+/-	+/- (46-51)	+/-	+/- (52-57)	+/-
C NO_2	1 4 2 6 0 2 (30-35)	C (36)	(37-39)	+/- (40-45)	+/-	+/- (46-51)	+/-	+/- (52-57)	+/-
D Pb	1 1 2 1 2 8 (30-35)	D (36)	(37-39)	+/- (40-45)	+/-	+/- (46-51)	+/-	+/- (52-57)	+/-

[1] COUNT ONLY REFERENCE OR EQUIVALENT MONITORING METHODS

FIGURE 1 FORM 1 (BACK)

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[44 FR 27571, May 10, 1979; 44 FR 65070, Nov. 9, 1979; 44 FR 72589, Dec. 14, 1979, as amended at 46 FR 44164, Sept. 3, 1981]

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Appendix B—Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring

1. General Information

This Appendix specifies the minimum quality assurance requirements of an organization operating a network of PSD stations. These requirements are regarded as the mimimum necessary for the control and assessment of the quality of the PSD ambient air monitoring data submitted to EPA. Organizations are encouraged to develop and implement quality assurance programs more extensive than the minimum required or to continue such programs where they already exist.

Quality assurance consists of two distinct and equally important functions. One function is the assessment of the quality of the monitoring data by estimating their precision and accuracy. The other function is the control, and improvement, of the quality of the monitoring data by implementation of quality control policies, procedures and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable.

In order to provide uniformity in the assessment and reporting of data quality, the assessment procedures are specified explicitly in sections 3, 4, 5 and 6 of this Appendix.

In contrast, the control and corrective action function encompasses a variety of policies, procedures, specifications, standards, and corrective measures which have varying effects on the resulting data quality. The selection and degree of specific control measures and corrective actions used depend on a number of factors such as the monitoring methods and equipment used, field and laboratory conditions, the objectives of the monitoring, the level of data quality needed, the expertise of personnel, the cost of control procedures, pollutant concentration levels, etc. Accordingly, quality control requirements are specified in general terms, in section 2 of this Appendix, to allow each organization to develop a quality control system which is most effective for its own circumstances.

For purposes of this Appendix "organization" is defined as a source owner/operator, a government agency, or their contractor which operates an ambient air pollution monitoring network for PSD purposes.

2. Quality Control Requirements

2.1 Each organization must develop and implement a quality control program consisting of policies, procedures, specifications, standards and documentation necessary to:

(1) Meet the monitoring objectives and quality assurance requirements of the permit granting authority.

(2) Minimize loss of air quality data due to malfunctions or out-of-control conditions.

The quality control program must be described in detail, suitably documented, and approved by the permit granting authority.

2.2 Primary guidance for developing the quality control program is contained in references 1 and 2, which also contain many suggested procedures, checks, and control specifications. Section 2.09 of Reference 2 describes specific guidance for the development of a quality control program for PSD automated analyzers and manual methods. Many specific quality control checks and specifications for manual methods are included in the respective reference methods described in Part 50 of this chapter, or in the respective equivalent method descriptions available from EPA (see reference 5). Similarly, quality control procedures related to specifically designated reference and equivalent analyzers are contained in their respective operation and instruction manuals. This guidance, and any other pertinent information from appropriate sources, should be used by organizations in developing their quality control programs.

As a minimum each quality control program must have operational procedures for each of the following activities:

(1) Selection of methods, analyzers, or samplers.

(2) Installation of equipment.

(3) Calibration.

(4) Zero and span checks and adjustments of automated analyzers.

(5) Control checks and their frequency.

(6) Control limits for zero, span and other control checks, and respective corrective actions when such limits are surpassed.

(7) Calibration and zero/span checks for multiple range analyzers.

(8) Preventive and remedial maintenance.

(9) Recording and validating data.

(10) Documentation of quality control information.

2.3 *Pollutant Standards.*

2.3.1 Gaseous standards (permeation tubes, permeation devices or cylinders of compressed gas) used to obtain test concentrations for CO, SO_2, and NO_2 must be working standards certified by comparison to a National Bureau of Standards (NBS) gaseous Standard Reference Material (SRM). A

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traceability protocol for certifying a working standard by direct comparison to an NBS SRM is given in reference 3. Direct use of an NBS SRM as a working standard is not prohibited but is discouraged because of the limited supply and expense of NBS SRM's.

2.3.2 Test concentrations for ozone must be obtained in accordance with the UV photometric calibration procedure specified in Appendix D of Part 50 of this chapter, or by means of an ozone transfer standard which has been certified. Consult reference 4 for guidance on ozone transfer standards.

2.3.3 Flow measurements must be made by a flow measuring instrument which is traceable to an authoritative volume or other standard.

2.4 Performance and System Audit Programs

The organization operating a PSD monitoring network must participate in EPA's national performance audit program. The permit granting authority, or EPA, may conduct system audits of the ambient air monitoring programs of organizations operating PSD networks. See section 1.4.16 of reference 1 and reference 6 for additional information about these programs. Organizations should contact either the appropriate EPA Regional Quality Control Coordinator or the Quality Assurance Branch, EMSL/RTP, at the address given in reference 3 for instructions for participation.

3. Data Quality Assessment Requirements

3.1 *Precision of Automated Methods.*

A one-point precision check must be carried out at least once every two weeks on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.08 and 0.10 ppm for SO_2, NO_2 and O_3 analyzers, and between 8 and 10 ppm for CO analyzers. The standards from which precision check test concentrations are obtained must meet the specifications of section 2.3. Except for certain CO analyzers described below, analyzers must operate in their normal sampling mode during the precision check, and the test atmosphere must pass through all filters, scrubbers, conditioners, and other components used during normal ambient sampling and as much of the ambient air inlet system as is practicable. If permitted by the associated operation or instruction manual, a CO analyzer may be temporarily modified during the precision check to reduce vent or purge flows, or the test atmosphere may enter the analyzer at a point other than the normal sample inlet, *provided that* the analyzer's response is not likely to be altered by these deviations from the normal operational mode.

If a precision check is made in conjunction with zero/span adjustment, it must be made prior to such zero and span adjustments. The difference between the actual concentration of the precision check gas and the concentration indicated by the analyzer is used to assess the precision of the monitoring data as described in section 4.1. Report data only from automated analyzers that are approved for use in the PSD network.

3.2 *Accuracy of Automated Methods.*

Each sampling quarter audit each analyzer that monitors for SO_2, NO_2, O_3 or CO at least once. The audit is made by challenging the analyzer with at least one audit gas of known concentration from each of the following range which fall within the measurement range of the analyzer being audited:

Audit point	Concentration range, ppm	
	SO_2, NO_2, O_3	CO
1	0.03–0.08	3–8
2	0.15–0.20	15–20
3	0.35–0.45	35–45
4	0.80–0.90	80–90

The standards from which audit gas test concentrations are obtained must meet the specifications of section 2.3. Working and transfer standards and equipment used for auditing must be different from the standards and equipment used for calibration and spanning. The auditing standards and calibration standards may be referenced to the same NBS SRM or primary UV photometer. The auditor must not be the operator/analyst who conducts the routine monitoring, calibration and analysis.

The audit shall be carried out by allowing the analyzer to analyze an audit test atmosphere in the same manner as described for precision checks in section 3.1. The exception given in section 3.1 for certain CO analyzers does not apply for audits.

The difference between the actual concentration of the audit test gas and the concentration indicated by the analyzer is used to assess the accuracy of the monitoring data as described in section 4.2. Report data only from automated analyzers that are approved for use in the PSD network.

3.3 *Precision of Manual Methods.*

3.3.1 *TSP Method.* For a given organization's monitoring network, one sampling site must have collocated samplers. A site with the highest expected 24-hour pollutant concentration must be selected. The two samplers must be within 4 meters of each other but at least 2 meters apart to preclude airflow interference. Calibration, sampling and analysis must be the same for both collocated samplers as well as for all other samplers in the network. The collocated samplers must be operated as a minimum every third day when continuous sampling is used.

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When a less frequent sample schedule is used, the collocated samplers must be operated at least once each week. For each pair of collocated samplers, designate one sampler as the sampler which will be used to report air quality for the site and designate the other as the duplicate sampler. The differences in measured concentration ($\mu g/m^3$) between the two collocated samplers are used to calculate precision as described in section 5.1.

3.3.2 *Pb Method.* The operation of collocated samplers at one sampling site must be used to assess the precision of the reference or an equivalent Pb method. The procedure to be followed for Pb methods is the same as described in 3.3.1 for the TSP method. If approved by the permit granting authority, the collocated TSP samplers may serve as the collocated lead samplers.

3.4 *Accuracy of Manual Methods.*

3.4.1 *TSP Method.* Each sampling quarter audit the flow rate of each high-volume sampler at least once. Audit the flow rate at one flow rate using a reference flow device described in section 2.2.8, pages 3–5, of reference 2, or a similar transfer flow standard. The device used for auditing must be different from the one used to calibrate the flow of the high-volume sampler being audited. The auditing device and the calibration device may both be referenced to the same primary flow standard. With the audit device in place, operate the high-volume sampler at its normal flow rate. The difference in flow rate (in m^3/min) between the audit flow measurement and the flow indicated by the sampler's normal flow indicator are used to calculate accuracy as described in section 5.2.

Great care must be used in auditing high-volume samplers having flow regulators because the introduction of resistance plates in the audit device can cause abnormal flow patterns at the point of flow sensing. For this reason, the orifice of the flow audit device should be used with a normal glass fiber filter in place and without resistance plates in auditing flow regulated high-volume samplers, or other steps should be taken to assure that flow patterns are not perturbed at the point of flow sensing.

3.4.2 *Pb Method.* For the reference method (Appendix G of Part 50 of this chapter) during each sampling quarter audit the flow rate of each high-volume Pb sampler at least once. The procedure to be followed for lead methods is the same as described in section 3.4.1 for the TSP method.

For each sampling quarter, audit the Pb analysis using glass fiber filter strips containing a known quantity of lead. Audit samples are prepared by depositing a Pb solution on 1.9 cm by 20.3 cm (¾ inch by 8 inch) unexposed glass fiber filter strips and allowing to dry thoroughly. The audit samples must be prepared using reagents different from those used to calibrate the Pb analytical equipment being audited. Prepare audit samples in the following concentration ranges:

Ranges	Pb concentration μg/strip	Equivalent ambient Pb concentration [1] $\mu g/m^3$
1	100 to 300	0.5 to 1.5.
2	600 to 1,000	3.0 to 5.0.

[1] Equivalent ambient Pb concentration in $\mu g/m^3$ is based on sampling at 1.7 m^3/min for 24 hours on 20.3 cm x 25.4 cm (8 inch x 10 inch) glass fiber filter.

Audit samples must be extracted using the same extraction procedure used for exposed filters.

Analyze at least one audit sample in each of the two ranges each day that samples are anlayzed. The difference between the audit concentration (in μg Pb/strip) and the analyst's measured concentration (in μg Pb/strip is used to calculate accuracy as described in section 5.4.

The accuracy of an equivalent method is assessed in the same manner as the reference method. The flow auditing device and Pb analysis audit samples must be compatible with the specific requirements of the equivalent method.

4. Calculations for Automated Methods

4.1 *Single Analyzer Precision.*

Each organization, at the end of each sampling quarter, shall calculate and report a precision probability interval for each analyzer. Directions for calculations are given below and directions for reporting are given in section 6. If monitoring data are invalidated during the period represented by a given precision check, the results of that precision check shall be excluded from the calculations. Calculate the percentage difference (d_i) for each precision check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \quad (1)$$

where:

Y_i = analyzer's indicated concentration from the i-th precision check

X_i = known concentration of the test gas used for the i-th precision check.

For each instrument, calculate the quarterly average (d_i), equation 2, and the standard deviation (S_i), equation 3.

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$$\bar{d}_j = \frac{1}{n}\sum_{i=1}^{n} d_i \quad (2)$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_{i=1}^{n} d_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} d_i\right)^2\right]} \quad (3)$$

where n is the number of precision checks on the instrument made during ther sampling quarter. For example, n should be 6 or 7 if span checks are made biweekly during a quarter.

Calculate the 95 percent probability limits for precision using equation 4 and 5.

Upper 95 Percent Probability Limit = $d_j + 1.96\ S_j$ (4)

Lower 95 Percent Probability Limit = $d_j - 1.96\ S_j$ (5)

4.2 *Single Analyzer Accuracy.*

Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each audit concentration for each analyzer audited during the quarter. Directions for calculations are given below (directions for reporting are given in section 6).

Calculate and report the percentage difference (d_i) for each audit concentration using equation 1 where Y_i is the analyzer's indicated concentration from the i-th audit check and X_i is the known concentration of the audit gas used for the i-th audit check.

5. Calculations For Manual Methods

5.1 *Single Instrument Precision for TSP and Pb.* Estimates of precision for ambient air quality measurements from the TSP and Pb methods are calculated from results obtained from the collocation of two samplers at one sampling site as described in section 3.3.1 for TPS and 3.3.2 for Pb. At the end of each sampling quarter, calculate and report a precision probability interval using weekly collocation sampler results. Directions for calculation are given below and directions for reporting are given in section 6.

For the paired measurements described in section 3.3.1 or 3.3.2 calculate the percentage difference (d_i) using equation 1 where Y_i is the TSP or Pb concentration measured by the duplicate sampler and X_i is the TSP or Pb concentration measured by the sampler reporting air quality for the site. Calculate the quarterly average percentage difference ($\bar{d}_j$), equation 2, standard deviation (S_j), equation 3, and upper and lower 95 percent probability limits for precision (equations 6 and 7).

Upper 95 Percent Probability Limit

$$\bar{d}_j + 1.96 S_j \sqrt{2} \quad (6)$$

Lower 95 Percent Probability Limit

$$\bar{d}_j - 1.96 S_j \sqrt{2} \quad (7)$$

5.2 *Single Instrument Accuracy for TSP.*

Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each high-volume sampler audited during the quarter. Directions for calculation are given below and directions for reporting are given in section 6.

For the flow rate audit described in section 3.4, let X_i represent the known flow rate and Y_i represent the indicated flow rate. Calculate the percentage difference (d_i) using equation 1.

5.3 *Single Instrument Accuracy for Pb.* Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each high-volume lead sampler audited during the quarter. Directions for calculation are given in 5.2 and directions for reporting are given in section 6.

5.4 *Single-Analysis-Day Accuracy for Pb.* Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each Pb analysis audit during the quarter. Directions for calculations are given below and directions for reporting are given in section 6.

For each analysis audit for Pb described in section 3.4.2, let X_i represent the known value of the audit sample and Y_i the indicated value of Pb. Calculate the percentage difference (d_i) for each audit at each concentration level using equation 1.

6. Organization Reporting Requirements

At the end of each sampling quarter, the organization must report the following data assessment information:

(1) For automated analyzers—precision probability limits from section 4.1 and percentage differences from section 4.2, and

(2) For manual methods—precision probability limits from section 5.1 and percentage differences from sections 5.2 and 5.3. The precision and accuracy information for the entire sampling quarter must be submitted with the air monitoring data. All data used to calculate reported estimates of precision and accuracy including span checks, collocated sampler and audit results must be made available to the permit granting authority upon request.

References

1. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I—Principles." EPA-600/9-76-005, March 1976. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, North Carolina 27711.

2. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II—Ambient Air Specific Methods." EPA-

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600/4-77-027a, May 1977. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, North Carolina 27711.

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4. "Transfer Standards for Calibration of Ambient Air Monitoring Analyzers for Ozone," June 1978. Available from U.S. Environmental Protection Agency, Department E (MD-77), Research Triangle Park, North Carolina 27711.

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6. "Criteria, Procedures, and Forms for the Evaluation of Ambient Air Monitoring Programs—Laboratory and Field," June 1978. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD-77), Research Triangle Park, North Carolina 27711.

[44 FR 27571, May 10, 1979; 44 FR 65070, Nov. 9, 1979; 44 FR 72592, Dec. 14, 1979, as amended at 46 FR 44168, Sept. 3, 1981]

Appendix C—Ambient Air Quality Monitoring Methodology

1.0 Purpose

This appendix specifies the monitoring methods (manual methods or automated analyzers) which must be used in State ambient air quality monitoring stations.

2.0 State And Local Air Monitoring Stations (SLAMS)

2.1 Except as otherwise provided in this appendix, a monitoring method used in a SLAMS must be a reference or equivalent method as defined in § 50.1 of this chapter.

2.2 Any analyzer for SO_2, CO, or O_3, purchased before February 18, 1976, may be used in a SLAMS until February 18, 1980. Any analyzer for NO_2 purchased before January 3, 1978, may be used in a SLAMS until January 3, 1980. Any method for lead in use before June 6, 1979, may be used in a SLAMS until June 6, 1980.

2.2.1 Any analyzer for SO_2, CO, or O_3 purchased before February 18, 1976, may be used in a SLAMS until February 18, 1980.

2.2.2 Any analyzer for NO_2 purchased before January 3, 1978, may be used in a SLAMS until January 3, 1980.

2.3 Any manual method or analyzer purchased prior to cancellation of its reference or equivalent method designation under § 53.11 or § 53.16 of this chapter may be used in a SLAMS following cancellation for a reasonable period of time to be determined by the Administrator.

2.4 *Use of Nonconforming Analyzers in Certain Geographical Areas.*

2.4.1 The State may use an analyzer that is not a reference or equivalent method in a SLAMS in a particular geographical area if the analyzer was purchased prior to February 18, 1975, and the Administrator determines:

2.4.1.1 That the analyzer (or the method of which the analyzer is representative) meets all the requirements of Part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except: (A) the test for interference equivalent specified in § 53.23(d) of this chapter, and (B) requirements of Subpart C of Part 53 of this chapter, if applicable, to the extent that failure to meet the Subpart C requirements results from sensitivity to interferants; and

2.4.1.2 That interferants that cause or would cause the analyzer to fail the requirements of § 53.23(d) and Subpart C of Part 53 of this chapter do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed. For purposes of this section (2.4), a "significant concentration" means one that would cause a measurement error equal to or greater than the lower detectable limit specification in Table B-1 in Subpart B of Part 53 of this chapter.

2.4.2 Requests for approval under this section (2.4) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.4.2.1 The date on which the analyzer was purchased;

2.4.2.2 An identification and description of the geographical area in which use of the analyzer is proposed;

2.4.2.3 Such data or other information as may be necessary to demonstrate that the interferants referred to in section 2.4.1.2 do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed; and

2.4.2.4 Test data for tests conducted with the analyzer in accordance with Subpart C of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed, if Subpart C would apply if an application for a reference or equivalent method

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determination were submitted for the method of which the analyzer is representative.

2.4.3 Any person who has obtained approval of a request under this section (2.4) shall:

2.4.3.1 Assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request;

2.4.3.2 Report to the Administrator within 60 days any significant increase in concentrations of the interferants referred to in section 2.4.1.2 in the geographical area identified in the request and concurrently submit such new or additional information as may be necessary to supplement the demonstration required by section 2.4.2.3; and

2.4.3.3 On a semi-annual basis, submit reports containing such data or other information as may be necessary to demonstrate that the interferants referred to in section 2.4.1.2 continue to occur in insignificant concentrations in the geographical area identified in the request. Reports required by this section (2.4.3) shall be submitted to the address specified in subsection 2.7.1.

2.5 *Use of Methods with Nonconforming Ranges.*

2.5.1 The State may use in a SLAMS an analyzer that is not a reference or equivalent method if:

2.5.1.1 The analyzer was purchased prior to February 18, 1975;

2.5.1.2 The Administrator determines that the analyzer (or the method of which the analyzer is representative) meets all requirements of Part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except the range requirement specified in Table B-1 in Subpart B of Part 53 of this chapter; and

2.5.1.3 The range of the analyzer does not extend to concentrations more than two times the upper range limit specified in such Table B-1, or, if the analyzer has more than one selectable range, the analyzer will not be used while operated in any range extending to such concentrations.

NOTE: If the use of the analyzer is approved under section 2.6, the limitations specified in this section (2.5.1.3) will not apply unless the approval under section 2.6 is later withdrawn.

2.5.2 Requests for approval under this section (2.5) must meet the submittal requirements of section 2.7. Except as provided in section 2.7.3, each such request must contain the information specified in section 2.7.2 in addition to the following:

2.5.2.1 The date on which the analyzer was purchased; and

2.5.2.2 A statement that the range of the analyzer does not extend to concentrations more than two times the upper range limit specified in Table B-1 in Subpart B of Part 53 of this chapter, or, if the analyzer has more than one selectable range, that the analyzer will not be operated in any range extending to such concentrations.

NOTE: If use of the analyzer is approved under section 2.6, the statements required by this section (2.5.2.2) will be considered inapplicable unless the approval under section 2.6 is later withdrawn.

2.5.3 Any person who has obtained approval of a request under this section (2.5) shall, if the analyzer has more than one selectable range, assure that the analyzer is not operated in any range extending to concentrations more than two times the upper range limit specified in such Table B-1.

2.6 *Use of methods with higher, unapproved, or nonconforming ranges in certain geographical areas.*

2.6.1 *Unapproved ranges.* Until January 1, 1983, a designated analyzer (reference or equivalent method) may be used without special approval as required by section 2.7 while operating on a range higher (broader) than the range or ranges covered by the analyzer's designation, provided that (1) the range does not extend to concentrations more than two times the upper range limit specified in Table B-1 of Part 53 of this chapter, (2) the analyzer is located in a geographical area where the pollutant to be measured is likely to occur in concentrations higher than the range for which the analyzer is designated, and (3) the unapproved range is used only during periods when those higher concentrations are likely to occur.

2.6.2 *Nonconforming ranges.* An analyzer may be used (indefinitely) on a range which extends to concentrations higher than two times the upper limit specified in Table B-1 of Part 53 of this chapter if:

2.6.2.1 The analyzer has more than one selectable range and has been designated as a reference or equivalent method on at least one of its ranges, or has been approved for use under section 2.5 (which applies to analyzers purchased before February 18, 1975);

2.6.2.2 The pollutant intended to be measured with the analyzer is likely to occur in concentrations more than two times the upper range limit specified in Table B-1 of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.2.3 The Administrator determines that the resolution of the range or ranges for which approval is sought is adequate for its intended use. For purposes of this section (2.6), "resolution" means the ability of the analyzer to detect small changes in concentration.

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2.6.3 Requests for approval under section 2.6.2 must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each request must contain the information specified in subsection 2.7.2 in addition to the following:

2.6.3.1 The range or ranges proposed to be used;

2.6.3.2 Test data, records, calculations, and test results as specified in subsection 2.7.2.2 for each range proposed to be used;

2.6.3.3 An identification and description of the geographical area in which use of the analyzer is proposed;

2.6.3.4 Data or other information demonstrating that the pollutant intended to be measured with the analyzer is likely to occur in concentrations more than two times the upper range limit specified in Table B-1 of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.3.5 Test data or other information demonstrating the resolution of each proposed range that is broader than that permitted by section 2.5.

2.6.4 Any person who has obtained approval of a request under this section (2.6.2) shall assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request and only while operated in the range or ranges specified in the request.

2.7 *Requests for Approval; Withdrawal of Approval.*

2.7.1 Requests for approval under sections 2.4, 2.5, or 2.6.2 must be submitted to: Director, Environmental Monitoring and Support Laboratory, Department E (MD 75), United States Environmental Protection Agency, Environmental Research Center, Research Triangle Park, North Carolina 27711.

2.7.2 Except as provided in section 2.7.3, each request must contain:

2.7.2.1 A statement identifying the analyzer (e.g., by serial number) and the method of which the analyzer is representative (e.g., by manufacturer and model number); and

2.7.2.2 Test data, records, calculations, and test results for the analyzer (or the method of which the analyzer is representative) as specified in Subpart B, Subpart C, or both (as applicable) of Part 53 of this chapter.

2.7.3 A request may concern more than one analyzer or geographical area and may incorporate by reference any data or other information known to EPA from one or more of the following:

2.7.3.1 An application for a reference or equivalent method determination submitted to EPA for the method of which the analyzer is representative, or testing conducted by the applicant or by EPA in connection with such an application;

2.7.3.2 Testing of the method of which the analyzer is representative at the initiative of the Administrator under § 53.7 of this chapter; or

2.7.3.3 A previous or concurrent request for approval submitted to EPA under this section (2.7).

2.7.4 To the extent that such incorporation by reference provides data or information required by this section (2.7) or by sections 2.4, 2.5, or 2.6, independent data or duplicative information need not be submitted.

2.7.5 After receiving a request under this section (2.7), the Administrator may request such additional testing or information or conduct such tests as may be necessary in his judgment for a decision on the request.

2.7.6 If the Administrator determines, on the basis of any information available to him, that any of the determinations or statements on which approval of a request under this section (2.7) was based are invalid or no longer valid, or that the requirements of section 2.4, 2.5, or 2.6, as applicable, have not been met, he may withdraw the approval after affording the person who obtained the approval an opportunity to submit information and arguments opposing such action.

2.8 *Modifications of Methods by Users.*

2.8.. Except as otherwise provided in this section (2.8), no reference method, equivalent method, or alternative method may be used in a SLAMS if it has been modified in a manner that will, or might, significantly alter the performance characteristics of the method without prior approval by the Administrator. For purposes of this section (2.8), "alternative method" means an analyzer the use of which has been approved under section 2.4, 2.5, or 2.6 of this appendix or some combination thereof.

2.8.2 Requests for approval under this section (2.8) must meet the submittal requirements of sections 2.7.1 and 2.7.2.1 of this appendix.

2.8.3 Each request submitted under this section (2.8) must include:

2.8.3.1 A description, in such detail as may be appropriate, of the desired modification;

2.8.3.2 A brief statement of the purpose(s) of the modification, including any reasons for considering it necessary or advantageous;

2.8.3.3 A brief statement of belief concerning the extent to which the modification will or may affect the performance characteristics of the method; and

2.8.3.4 Such further information as may be necessary to explain and support the statements required by sections 2.8.3.2 and 2.8.3.3.

2.8.4 Within 75 days after receiving a request for approval under this section (2.8) and such further information as he may re-

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quest for purposes of his decision, the Administrator will approve or disapprove the modification in question by letter to the person or agency requesting such approval.

2.8.5 A temporary modification that will or might alter the performance characteristics of a reference equivalent, or alternative method may be made without prior approval under this section (2.8) if the method is not functioning or is malfunctioning, provided that parts necessary for repair in accordance with the applicable operation manual cannot be obtained within 45 days. Unless such temporary modification is later approved under section 2.8.4, the temporarily modified method shall be repaired in accordance with the applicable operation manual as quickly as practicable but in no event later than 4 months after the temporary modification was made, unless an extension of time is granted by the Administrator. Unless and until the temporary modification is approved, air quality data obtained with the method as temporarily modified must be clearly identified as such when submitted in accordance with § 58.28 or § 58.35 of this chapter and must be accompanied by a report containing the information specified in section 2.8.3. A request that the Administrator approve a temporary modification may be submitted in accordance with sections 2.8.1 through 2.8.4. In such cases the request will be considered as if a request for prior approval had been made.

3.0 National Air Monitoring Stations (NAMS)

3.1 Methods used in those SLAMS which are also designated as NAMS to measure SO_2, CO, NO_2, or O_3 must be automated reference or equivalent methods (continuous analyzers).

4.0 Particulate Matter Episode Monitoring

4.1 For short-term measurements of particulate matter during air pollution episodes (see § 51.16 of this chapter) the measurement method must be:

4.1.1 Either the "Staggered High Volume Sampling" method or the "High Volume Sampling Over Short Sampling Times" method, both of which are based on the reference method for suspended particulates and are described in reference 1; or

4.1.2 Any other method for measuring suspended particulates:

4.1.2.1 Which has a measurement range or ranges appropriate to accurately measure air pollution episode concentrations of suspended particulates,

4.1.2.2. Which has a sample period appropriate for short-term measurements, and

4.1.2.3 For which a quantitative relationship to the reference method for suspended particulates has been established at the use site. Procedures for establishing a quantitative site-specific relationship are contained in reference 1.

4.2 *Quality Assurance.* Particulate methods other than the reference method are not covered under the quality assessment requirements of Appendix A. Therefore, States must develop and implement their own quality assessment procedures for those methods allowed under this Section 4. These quality assessment procedures should be similar or analogous to those described in Section 3 of Appendix A for the particulate reference method.

5.0 References

5.1 "Guidance for Selecting TSP Episode Monitoring Methods," U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, OAQPS No. 1.2-114, February, 1979.

(Secs. 110, 301(a), Clean Air Act as amended (42 U.S.C. 7410, 7601))

[44 FR 27571, May 10, 1979, as amended at 44 FR 37918, June 29, 1979; 44 FR 65070, Nov 9, 1979]

Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS)

1. SLAMS Monitoring Objectives and Spatial Scales
2. SLAMS Network Design Procedures
2.1 Background Information for Establishing SLAMS
2.2 Total Suspended Particulates (TSP) Design Criteria for SLAMS
2.3 Sulfur Dioxide (SO_2) Design Criteria for SLAMS
2.4 Carbon Monoxide (CO) Design Criteria for SLAMS
2.5 Ozone (O_3) Design Criteria for SLAMS
2.6 Nitrogen Dioxide (NO_2) Design Criteria for SLAMS
2.7 Lead (Pb) Design Criteria for SLAMS.
3. Network Design for National Air Monitoring Stations (NAMS)
3.1 Total Suspended Particulates (TSP) Design Criteria for NAMS
3.2 Sulfur Dioxide (SO_2) Design Criteria for NAMS
3.3 Carbon Monoxide (CO) Design Criteria for NAMS
3.4 Ozone (O_3) Design Criteria for NAMS
3.5 Nitrogen Dioxide (NO_2) Design Criteria for NAMS
3.6 Lead (Pb) Design Criteria for NAMS.

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4. Summary
5. References

1. SLAMS Monitoring Objectives and Spatial Scales

The purpose of this appendix is to describe monitoring objectives and general criteria to be applied in establishing the State and Local Air Monitoring Stations (SLAMS) networks and for choosing general locations for new monitoring stations. It also describes criteria for determining the number and location of National Air Monitoring Stations (NAMS). These criteria will also be used by EPA in evaluating the adequacy of SLAMS/NAMS networks.

The network of stations which comprise SLAMS should be designed to meet a minimum of four basic monitoring objectives. These basic monitoring objectives are: (1) To determine highest concentrations expected to occur in the area covered by the network; (2) to determine representative concentrations in areas of high population density; (3) to determine the impact on ambient pollution levels of significant sources or source categories; and (4) to determine general background concentration levels.

To a large extent, the existing State Implementation Plan (SIP) monitoring networks have been designed with these four objectives in mind. Thus, they can serve as the logical starting point for establishing the SLAMS network. This will, however, require a careful review of each existing SIP ambient network to determine the principal objectives of each station and the extent to which the location criteria presented herein are being met. It should be noted that this appendix contains no criteria for determining the total number of stations in SLAMS networks, except that a minimum number of lead SLAMS is prescribed. The optimum size of a particular SLAMS network involves trade offs among data needs and available resources which EPA believes can best be resolved during the network design process.

This appendix focuses on the relationship between monitoring objectives and the geographical location of monitoring stations. Included are a rationale and set of general criteria for identifying candidate station locations in terms of physical characteristics which most closely match a specific monitoring objective. The criteria for more specifically siting the monitoring station including spacing from roadways and vertical and horizontal probe placement, are described in Appendix E of this part.

To clarify the nature of the link between general monitoring objectives and the physical location of a particular monitoring station, the concept of spatial scale of representativeness of a monitoring station is defined. The goal in siting stations is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring objective of the station.

Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring station throughout which actual pollutant concentrations are reasonably similar. The scale of representativeness of most interest for the monitoring objectives defined above are as follows:

• *Microscale*—defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

• *Middle Scale*—defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.

• *Neighborhood Scale*—defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.

• *Urban Scale*—defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.

• *Regional Scale*—defines usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.

• *National and Global Scales*—these measurement scales represent concentrations characterizing the nation and the globe as a whole.

Proper siting of a monitoring station requires precise specification of the monitoring objective which usually includes a desired spatial scale of representativeness. For example, consider the case where the objective is to determine maximum CO concentrations in areas where pedestrians may reasonably be exposed. Such areas would most likely be located within major street canyons of large urban areas and near traffic corridors. Stations located in these areas are most likely to have a microscale of representativeness since CO concentrations typically peak nearest roadways and decrease rapidly as the monitor is moved from the roadway. In this example, physical location was determined by consideration of CO emission patterns, pedestrian activity, and physical characteristics affecting pollutant dispersion. Thus, spatial scale of representativeness was not used in the selection process but was a *result* of station location.

In some cases, the physical location of a station is determined from joint consideration of both the basic monitoring objective, and a desired spatial scale of representativeness. For example, to determine CO concentrations which are typical over a reasonably broad geographic area having relatively high CO concentrations, a neighborhood scale station is more appropriate. Such a

station would likely be located in a residential or commercial area having a high overall CO emission density but not in the immediate vicinity of any single roadway. Note that in this example, the desired scale of representativeness was an important factor in determining the physical location of the monitoring station.

In either case, classification of the station by its intended objective and spatial scale of representativeness is necessary and will aid in interpretation of the monitoring data.

Table 1 illustrates the relationship between the four basic monitoring objectives and the scales of representativeness that are generally most appropriate for that objective.

TABLE 1—RELATIONSHIP AMONG MONITORING OBJECTIVES AND SCALE OF REPRESENTATIVENESS

Monitoring objective	Appropriate siting scales
Highest concentration	Micro, middle, neighborhood (some-times urban).
Population	Neighborhood, urban.
Source impact	Micro, middle, neighborhood.
General/background	Neighborhood, regional.

Subsequent sections of this appendix describe in greater detail the most appropriate scales of representativeness and general monitoring locations for each pollutant.

2. SLAMS NETWORK DESIGN PROCEDURES

The preceding section of this appendix has stressed the importance of defining the objectives for monitoring a particular pollutant. Since monitoring data are collected to "represent" the conditions in a section or subregion of a geographical area, the previous section included a discussion of the scale of representativeness of a monitoring station. The use of this physical basis for locating stations allows for an objective approach to network design.

The discussion of scales in Sections 2.2-2.6 does not include all of the possible scales for each pollutant. The scales which are discussed are those which are felt to be most pertinent for SLAMS network design.

In order to evaluate a monitoring network and to determine the adequacy of particular monitoring stations, it is necessary to examine each pollutant monitoring station individually by stating its monitoring objective and determining its spatial scale of representativeness. This will do more than insure compatibility among stations of the same type. It will also provide a physical basis for the interpretation and application of the data. This will help to prevent mismatches between what the data actually represent and what the data are interpreted to represent. It is important to note that SLAMS are not necessarily sufficient for completely describing air quality. In many situations, diffusion models must be applied to complement ambient monitoring, e.g., determining the impact of point sources or defining boundaries of nonattainment areas.

2.1 *Background Information for Establishing SLAMS*

Background information that must be considered in the process of selecting SLAMS from the existing network and in establishing new SLAMS includes emission inventories, climatological summaries, and local geographical characteristics. Such information is to be used as a basis for the judgmental decisions that are required during the station selection process. For new stations, the background information should be used to decide on the actual location considering the monitoring objective and spatial scale while following the detailed procedures in References 1 through 4.

Emission inventories are generally the most important type of background information needed to design the SLAMS network. The emission data provide valuable information concerning the size and distribution of large point sources. Area source emissions are usually available for counties but should be subdivided into smaller areas or grids where possible, especially if diffusion modeling is to be used as a basis for determining where stations should be located. Sometimes this must be done rather crudely, for example, on the basis of population or housing units. In general, the grids should be smaller in areas of dense population than in less densely populated regions.

Emission inventory information for point sources should be generally available for any area of the country for annual and seasonal averaging times. Specific information characterizing the emissions from large point sources for the shorter averaging times (diurnal variations, load curves, etc.) can often be obtained from the source. Area source emission data by season, although not available from the EPA, can be generated by apportioning annual totals according to degree days.

Detailed area source data are also valuable in evaluating the adequacy of an existing station in terms of whether the station has been located in the desired spatial scale of representativeness. For example, it may be the desire of an agency to have an existing CO station measuring in the neighborhood scale.

By examining the traffic data for the area and examining the physical location of the station with respect to the roadways, a determination can be made as to whether or not the station is indeed measuring the air quality on the desired scale.

The climatological summaries of greatest use are the frequency distributions of wind

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speed and direction. The wind rose is an easily interpreted graphical presentation of the directional frequencies. Other types of useful climatological data are also available, but generally are not as directly applicable to the site selection process as are the wind statistics.

In many cases, the meteorological data originating from the most appropriate (not necessarily the nearest) national weather service (NWS) airport station in the vicinity of the prospective siting area will adequately reflect conditions over the area of interest, at least for annual and seasonal averaging times. In developing data in complex meteorological and terrain situations, diffusion meteorologists should be consulted. NWS stations can usually provide most of the relevant weather information in support of network design activities anywhere in the country. Such information includes joint frequency distributions of winds and atmospheric stability (stability-wind roses).

The geographical material is used to determine the distribution of natural features, such as forests, rivers, lakes, and manmade features. Useful sources of such information may include road and topographical maps, aerial photographs, and even satellite photographs. This information may include the terrain and land-use setting of the prospective monitor siting area, the proximity of larger water bodies, the distribution of pollutant sources in the area, the location of NWS airport stations from which weather data may be obtained, etc. Land use and topographical characteristics of specific areas of interest can be determined from U.S. Geological Survey (USGS) maps and land use maps. Detailed information on urban physiography (building/street dimensions, etc.) can be obtained by visual observations, aerial photography, and also surveys to supplement the information available from those sources. Such information could be used in determining the location of local pollutant sources in and around the prospective station locations.

2.2 *Total Suspended Particulates (TSP) Design Criteria for SLAMS*

The first step in designing the TSP SLAMS network is to collect the necessary background information as discussed previously. For TSP monitoring purposes, emphasis on background information would be placed on regional and traffic maps and aerial photographs showing topography, settlements, major industries, and highways. These maps and photographs would be used to identify areas of the type that are of concern to the particular monitoring objective. After potentially suitable monitoring areas for TSP have been identified on a map, a model [5] may be used to provide an estimate of TSP concentrations throughout the area of interest.

The second step is to evaluate existing TSP stations which are candidates for SLAMS designation. Stations meeting one or more of the four monitoring objectives shown in Section 1, must be classified into one of four scales of representativeness (middle, neighborhood, urban, and regional) if the stations are to become SLAMS. In siting and classifying TSP stations, the procedures described in reference 1 should be used to evaluate existing stations and must be used to relocate an existing station or to locate any new SLAMS stations.

The following describes in detail the characteristics of each of the four scales relevant to TSP SLAMS.

• *Middle Scale.*—Much of the measurement of short-term public exposure to particulates is on this scale. People moving through downtown areas, or living near major roadways, encounter particulates that would be adequately characterized by observations of this spatial scale. Thus, measurements of this type would be appropriate for the evaluation of possible short-term public health effects of particulate pollution. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with indirect sources, that is, complexes that do not produce pollutants themselves but which attract a significant number of autos. Shopping centers, stadia, and office buildings are examples of indirect sources. In the case of TSP, unpaved or seldom swept parking lots associated with indirect sources could be an important source in addition to the vehicular emissions themselves.

• *Neighborhood Scale.*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregion with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to the TSP concentration, as well as the land use and land surface characteristics. In some cases, a location carefully chosen to provide neighborhood scale data would represent not only the immediate neighborhood but also neighborhoods of the same type in other parts of the city. Stations of this kind provide good information about trends and compliance with standards because they often represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS. In the sense used here, this category includes industrial and commercial neighborhoods, as well as residential.

Neighborhood scale data could provide valuable information for developing, testing, and revising models that describe the larger-

[5] See Reference at end of Appendix E.

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scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. The neighborhood scale measurements could also be used for neighborhood comparisons within or between cities. This is the most likely scale of measurement to meet the needs of planners.

• *Urban Scale.*—This class of measurement would be made to typify the particulate concentration over an entire metropolitan area. Such measurements would be useful for assessing trends in city-wide air quality, and hence, the effectiveness of large scale air pollution control strategies.

• *Regional Scale.*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditions for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas with reasonably uniform ground cover. Data characteristics of this scale would provide information about larger-scale processes of particulate emissions, losses, and transport.

2.3 *Sulfur Dioxide (SO_2) Design Criteria for SLAMS*

The spatial scales for SO_2 SLAMS monitoring are the middle, neighborhood, urban, and regional scales. Because of the nature of SO_2 distributions over urban areas, the middle scale is the most likely scale to be represented by a single measurement in an urban area, but only if the undue effects from local sources (minor or major point sources) can be eliminated. Neighborhood scales would be those most likely to be represented by single measurements in suburban areas where the concentration gradients are less steep. Urban scales would represent areas where the concentrations are uniform over a larger geographical area. Regional scale measurements would be associated with rural areas.

• *Middle Scale.*—Some data uses associated with middle scale measurements for SO_2 include assessing the effects of control strategies to reduce urban concentrations (especially for the 3-hour and 24-hour averaging times) and monitoring air pollution episodes.

• *Neighborhood Scale.*—This scale applies in areas where the SO_2 concentration gradient is relatively flat (mainly suburban areas surrounding the urban center) or in large sections of small cities and towns. In general, these areas are quite homogeneous in terms of SO_2 emission rates and population density. Thus, neighborhood scale measurements may be associated with baseline concentrations in areas of projected growth and in studies of population responses to exposure to SO_2. Also concentration maxima associated with air pollution episodes may be uniformly distributed over areas of neighborhood scale, and measurements taken within such an area would represent neighborhood, and to a limited extent, middle scale concentrations.

• *Urban Scale.*—Data from this scale could be used for the assessment of air quality trends and the effect of control strategies on urban scale air quality.

• *Regional Scale.*—These measurements would be applicable to large homogeneous areas, particularly those which are sparsely populated. Such measurements could provide information on background air quality and interregional pollutant transport.

After the spatial scale has been selected to meet the monitoring objectives for each station location, the procedures found in reference 2 should be used to evaluate the adequacy of each existing SO_2 station and must be used to relocate an existing station or to locate any new SLAMS stations. The background material for these procedures should consist of emission inventories, meteorological data, wind roses, and maps for population and topographical characteristics of specific areas of interest. Isopleth maps of SO_2 air quality as generated by diffusion models[5] are useful for the general determination of a prospective area within which the station is eventually placed.

2.4 *Carbon Monoxide (CO) Design Criteria for SLAMS*

Micro, middle, and neighborhood scale measurements are necessary station classifications for SLAMS since most people are exposed to CO concentrations in these scales. Carbon monoxide maxima occur primarily in areas near major roadways and intersections with high traffic density and poor atmospheric ventilation. As these maxima can be predicted by ambient air quality modeling, a large fixed network of CO monitors is not required. Long-term CO monitoring should be confined to a limited number of micro and neighborhood scale stations in large metropolitan areas to measure maximum pollution levels and to determine the effectiveness of control strategies.

• *Microscale.*—Measurements on this scale would represent distributions within street canyons, over sidewalks, and near major roadways. The measurements at a particular location in a street canyon would be typical of one high concentration area which can be shown to be a representation of many more areas throughout the street canyon or other similar locations in a city. This is a scale of measurement that would provide valuable information for devising and evaluating "hot spot" control measures.

• *Middle Scale.*—This category covers dimensions from 100 meters to 0.5 kilometer. In certain cases discussed below, it may apply to regions that have a total length of several kilometers. In many cases of interest, sources and land use may be reasonably

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homogeneous for long distances along a street, but very inhomogeneous normal to the street. This is the case with strip development and freeway corridors. Included in this category are measurements to characterize the CO concentrations along the urban features just enumerated. When a location is chosen to represent conditions in a block of street development, then the characteristic dimensions of this scale are tens of meters by hundreds of meters. If an attempt is made to characterize street-side conditions throughout the downtown area or along an extended stretch of freeway, the dimensions may be tens of meters by kilometer.

The middle scale would also include the parking lots and feeder streets associated with indirect sources which attract significant numbers of pollutant emitters, particularly autos. Shopping centers, stadia, and office buildings are examples of indirect sources.

• *Neighborhood Scale.*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregions, with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to CO concentration, but it probably also applies to land use. In some cases, a location carefully chosen to provide neighborhood scale data, might represent not only the immediate neighborhood, but also neighborhoods of the same type in other parts of the city. These kinds of stations would provide information relating to health effects because they would represent conditions in areas where people live and work. Neighborhood scale data would provide valuable information for developing, testing, and revising concepts and models that describe the larger scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. These types of measurements could also be used for interneighborhood comparisons within or between cities.

After the spatial scale has been determined to meet the monitoring objectives for each location, the location selection procedures, as shown in reference 3 should be used to evaluate the adequacy of each existing CO station and must be used to relocate an existing station or to locate any new SLAMS stations. The background material necessary for these procedures may include the average daily traffic on all streets in the area, wind roses for different hours of the day, and maps showing one-way streets, street widths, and building heights. If the station is to typify the area with the highest concentrations, the streets with the greatest daily traffic should be identified. If some streets are one-way, those streets that have the greatest traffic during the afternoon and evening hours should be selected as tentative locations, because the periods of high traffic volume are usually of greatest duration through the evening hours. However, the strength of the morning inversion has to be considered along with the traffic volume and pattern when seeking areas with the highest concentrations. Traffic counters near the stations will provide valuable data for interpreting the observed CO Concentrations.

Monitors should not be placed in the vicinity of possible anomalous source areas. Examples of such areas include toll gates on turnpikes, metered freeway ramps, and drawbridge approaches. Additional information on network design may be found in reference 3.

2.5 *Ozone (O_3) Design Criteria for SLAMS*

Ozone is not directly emitted into the atmosphere but results from complex photochemical reactions involving organic compounds, oxides of nitrogen, and solar radiation.

The relationships between primary emissions (precursors) and secondary pollutants (O_3) tend to produce large separations spatially and temporally between the major sources and the areas of high oxidant pollution. This suggests that the meteorological transport process and the relationships between sources and sinks need to be considered in the development of the network design criteria and placement of monitoring stations, especially in measuring peak concentration levels.

The principal spatial scales for SLAMS purposes based on the monitoring objectives are neighborhood, urban, regional, and to a lesser extent, middle scale. Since ozone requires appreciable formation time, the mixing of reactants and products occurs over large volumes of air, and this reduces the importance of monitoring small scale spatial variability.

• *Middle Scale.*—Measurement in this scale would represent conditions close to sources of NO_x such as roads where it would be expected that suppression of O_3 concentrations would occur. Measurements at these stations would represent conditions over relatively small portions of the urban area.

• *Neighborhood Scale.*—Measurements in this category represent conditions throughout some reasonably homogeneous urban subregion, with dimensions of a few kilometers. Homogeneity refers to pollutant concentrations. Neighborhood scale data will provide valuable information for developing, testing, and revising concepts and models that describe urban/regional concentration patterns. They will be useful to the understanding and definition of processes that take periods of hours to occur and hence involve considerable mixing and transport.

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Under stagnation conditions, a station located in the neighborhood scale may also experience peak concentration levels within the urban areas.

• *Urban Scale.*—Measurement in this scale will be used to estimate concentrations over large portions of an urban area with dimensions of several kilometers to 50 or more kilometers. Such measurements will be used for determining trends, and designing area-wide control strategies. The urban scale stations would also be used to measure high concentrations downwind of the area having the highest precursor emissions.

• *Regional Scale.*—This scale of measurement will be used to typify concentrations over large portions of a metropolitan area and even larger areas with dimensions of as much as hundreds of kilometers. Such measurements will be useful for assessing the ozone that is transported into an urban area. Data from such stations may be useful in accounting for the ozone that cannot be reduced by control strategies in that urban area.

The location selection procedure continues after the spatial scale is selected based on the monitoring objectives. The appropriate network design procedures as found in reference 4, should be used to evaluate the adequacy of each existing O_3 monitor and must be used to relocate an existing station or to locate any new O_3 SLAMS stations. The first step in the siting procedure would be to collect the necessary background material, which may consist of maps, emission inventories for nonmethane hydrocarbons and oxides of nitrogen (NO_x), climatological data, and existing air quality data for ozone, nonmethane hydrocarbons, and NO_2/NO.

For locating a neighborhood scale station to measure typical city concentrations, a reasonably homogeneous geographical area near the center of the region should be selected which is also removed from the influence of major NO_x sources. For an urban scale station to measure the high concentration areas, the emission inventories should be used to define the extent of the area of important nonmethane hydrocarbons and NO_x emissions. The most frequent wind speed and direction for periods of important photochemical activity should be determined. Then the prospective monitoring area should be selected in a direction from the city that is most frequently downwind during periods of photochemical activity. The distance from the station to the upwind edge of the city should be about equal to the distance traveled by air moving for 5 to 7 hours at wind speeds prevailing during periods of photochemical activity. Prospective areas for locating O_3 monitors should always be outside the area of major NO_x.

In locating a neighborhood scale station which is to measure high concentrations, the same procedures used for the urban scale are followed except that the station should be located closer to the areas bordering on the center city or slightly further downwind in an area of high density population.

For regional scale background monitoring stations, the most frequent wind associated with important photochemical activity should be determined. The prospective monitoring area should be upwind for the most frequent direction and outside the area of city influence.

Where ozone levels have significant fluctuations throughout the year, consideration should be given to monitoring ozone only during the seasons when levels above the NAAQS occur as documented by previous data. Additional discussion on the procedures for siting ozone stations may be found in reference 4.

2.6 *Nitrogen Dioxide (NO_2) Design Criteria for SLAMS*

The typical spatial scales of representativeness associated with nitrogen dioxide monitoring based on monitoring objectives are middle, neighborhood, and urban. Since nitrogen dioxide is primarily formed in the atmosphere from the oxidation of NO, large volumes of air and mixing times usually reduce the importance of monitoring on small scale spatial variability especially for long averaging times. However, there may be some situations where NO_2 measurements would be made on the middle scale for both long- and short-term averages.

• *Middle Scale.*—Measurements on this scale would cover dimensions from about 100 meters to 0.5 kilometer. These measurements would characterize the public exposure to NO_2 in populated areas. Also monitors that are located closer to roadways than the minimum distances specified in Table 3 of Appendix E of this part, would be represented by measurements on this scale.

• *Neighborhood and Urban Scales.*—The same considerations as discussed in Section 2.5 for O_3 would also apply to NO_2.

After the spatial scale is selected based on the monitoring objectives, then the siting procedures as found in reference 4 should be used to evaluate the adequacy of each existing NO_2 station and must be used to relocate an existing station or to locate any new NO_2 SLAMS stations. The siting procedures begin with collecting the background material. This background information may include the characteristics of the area and its sources under study, climatological data to determine where concentration maxima are most likely to be found, and any existing monitoring data for NO_2.

For neighborhood or urban scales, the emphasis in site selection will be in finding those areas where long-term averages are expected to be the highest. Nevertheless, it

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should be expected that the maximum NO_2 concentrations will occur in approximately the same locations as the maximum total oxides of nitrogen concentrations. The best course would be to locate the station somewhat further downwind beyond the expected point of maximum total oxides of nitrogen to allow more time for the formation of NO_2. The dilution of the emissions further downwind from the source should be considered along with the need for reaction time for NO_2 formation in locating stations to measure peak concentration. If dispersion is favorable, maximum concentrations may occur closer to the emission sources than the locations predicted from oxidation of NO to NO_2 alone. This will occur downwind of sources based on winter wind direction or in areas where there are high ozone concentrations and high density NO_2 emissions such as on the fringe of the central business district or further downwind. The distance and direction downwind would be based on ozone season wind patterns.

Once the major emissions areas and wind patterns are known, areas of potential maximum NO_2 levels can be determined. Nitrogen dioxide concentrations are likely to decline rather rapidly outside the urban area. Therefore, the best location for measuring NO_2 concentrations will be in neighborhoods near the edge of the city.

2.7 *Lead (Pb) Design Criteria for SLAMS.* Presently, about 90 percent of the lead concentration in air originates from automobile exhaust, while the remaining 10 percent comes from industrial processes and stationary combustion sources. (*6*) The most important spatial scales to effectively characterize the emissions from both mobile and stationary sources are the micro, middle, and neighborhood scales. For purposes of establishing monitoring stations to represent large homogeneous areas other than the above scales of representativeness, urban or regional scale stations would also be needed.

Microscale—This scale would typify areas such as downtown street canyons and traffic corridors where the general public would be exposed to maximum concentrations from mobile sources. Because of the very steep ambient Pb gradients resulting from Pb emissions from mobile sources, (*7*) the dimensions of the microscale for Pb generally would not extend beyond 15 meters from the roadway. Emissions from stationary sources such as primary and secondary lead smelters, and primary copper smelters may under fumigation conditions likewise result in high ground level concentrations at the microscale. In the latter case, the microscale would represent an area impacted by the plume with dimensions extending up to approximately 100 meters. Data collected at microscale stations provide information for evaluating and developing "hot-spot" control measures.

Middle Scale—This scale generally represents lead air quality levels in areas up to several city blocks in size with dimensions on the order of approximately 100 meters to 500 meters. However, the dimensions for middle scale roadway type stations would probably be on the order of 50–150 meters because of the exponential decrease in lead concentration with increasing distances from roadways. The middle scale may for example, include schools and playgrounds in center city areas which are close to major roadways. Pb monitors in such areas are desirable because of the higher sensitivity of children to exposures to Pb concentrations. (*7*) Emissions from point sources frequently impact on areas at which single sites may be located to measure concentrations representing middle spatial scales.

Neighborhood Scale—The neighborhood scale would characterize air quality conditions throughout some relatively uniform land use areas with dimensions in the 0.5 to 4.0 kilometer range. Stations of this scale would provide monitoring data in areas representing conditions where children live and play. Monitoring in such areas is important since this segment of the population is more susceptible to the effects of lead.

Urban Scale—Such stations would be used to present ambient Pb concentrations over an entire metropolitan area with dimensions in the 4 to 50 kilometer range. An urban scale station would be useful for assessing trends in city-wide air quality and the effectiveness of larger scale air pollution control strategies.

Regional Scale—Measurements from these stations would characterize air quality levels over areas having dimensions of 50 to hundreds of kilometers. This large scale of representativeness would be most applicable to sparsely populated areas and could provide information on background air quality and interregional pollutant transport.

Monitoring data for ambient Pb levels are required in major urbanized areas, particularly where Pb levels have been shown or are expected to be of significant concern such locations are to be expected in urban areas having high population densities and accompanying high traffic densities. The total number and type of stations for SLAMS are not prescribed but must be determined on a case-by-case basis. As a minimum there must be two stations in any urbanized area which has a population exceeding 500,000. Also, as a minimum, there must be two stations in any area where lead concentrations currently exceed or have exceeded 1.5 $\mu g/m^3$ quarterly arithmetic mean measured since January 1, 1974. For those areas less than 500,000 population where the lead concentrations have exceeded 1.5

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$\mu g/m^3$ quarterly arithmetic mean, the Regional Administrator may waive the requirement for establishing SLAMS provided the State can demonstrate that measured lead concentrations have not exceeded the NAAQS for the eight quarters prceeding the lead monitoring plan submission required by § 58.20. For locations where monitors are not being operated at the time of the Pb monitoring plan submission, data showing attainment during the final eight quarters of operation will generally provide the basis for the waiver. The EPA Regional Administrator may specify more than two monitoring stations if it is found that two stations are insufficient to adequately determine if the Pb standard is being attained and maintained. The Regional Administrator may also specify that stations be located in areas outside the boundaries of the urbanized areas.

Concerning the previously discussed required minimum of two stations, one of the stations must be a category (a) type station and the second a category (b) station. Both of these categories of stations are defined in section 3. For areas where the predominant lead levels come from automotive sources, the category (a) station must be a microscale or middle scale station located near a major roadway [>30,000 average daily traffic, (ADT)] in order to measure maximum Pb concentrations from mobile sources. In areas where there are no roadways exceeding 30,000 ADT, the station should be located near the roadway with the largest traffic volume. Studies (7, 8) indicate that lead levels decrease exponentially with distance from roadways. Thus, the higher concentrations are close to the roadway and stations located in such areas because of the steep concentration gradients, are most often found to represent the microscale and middle scale dimension. For areas where predominant lead levels come from point sources, the category (a) station generally represents the microscale or middle scale impact of the point source. However, in a few cases, sufficient mixing may occur during transport of the emissions from the source to the ground so that the category (a) station represents a neighborhood scale. The required category (b) station must be a neighborhood scale station since the microscale and middle scale station would not represent the air quality over large geographical areas and frequently may not be located in highly populated areas. It is recognized that in certain areas, a middle scale station may be located at schools or playgrounds near major roadways. However, in most cases, they are not located in such areas and since children (7) are the segment of the population most susceptible to the effects of lead and are more likely to live and play in the residential section of the urban area, the category (b) station should be located in residential areas having a combination of high population and traffic density. In the case where lead levels come primarily from point sources, the category (b) station generally represents a neighborhood scale impact of the point source.

To locate monitoring stations, it will be necessary to obtain background information such as stationary and mobile source emissions inventories, morning and evening traffic patterns, climatological summaries, and local geographical characteristics. Such information should be used to identify areas that are most suitable to the particular monitoring objective and spatial scale of representativeness desired. Reference 9 provides additional guidance on locating sites to meet specific urban area monitoring objectives and must be used in locating new stations or evaluating the adequacy of existing stations.

After locating each Pb station, and, to the extent practicable, taking into consideration the collective impact of all Pb sources and surrounding physical characteristics of the siting area, a spatial scale of representativeness must be assigned to each station.

Guidance on locating monitoring stations in the vicinity of stationary lead sources is given in reference 10. This reference provides assistance in designing a network to meet the monitoring objective of determining the impact of point sources on ambient Pb levels.

3. Network Design for National Air Monitoring Stations (NAMS)

The NAMS must be stations selected from the SLAMS network with emphasis given to urban and multisource areas. Areas to be monitored must be selected based on urbanized population and pollutant concentration levels. Generally, a larger number of NAMS are needed in more polluted urban and multisource areas. The network design criteria discussed below reflect these concepts. However, it should be emphasized that deviations from the NAMS network design criteria may be necessary in a few cases. Thus, these design criteria are not a set of rigid rules but rather a guide for achieving a proper distribution of monitoring sites on a national scale.

The primary objective for NAMS is to monitor in the areas where the pollutant concentration and the population exposure are expected to be the highest consistent with the averaging time of the NAAQS. Accordingly, the NAMS fall into two categories:

Category (a): Stations located in the area(s) of expected maximum concentrations (generally neighborhood scale, except microscale for CO, microscale or middle scale for Pb, and urban scale for O_3);

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Category (b): Stations which combine poor air quality with a high population density but not necessarily located in an area of expected maximum concentrations (neighborhood scale, except urban scale for NO_2). Category (b) monitors would generally be representative of larger spatial scales than category (a) monitors.

For each urban area where NAMS are required, both categories of monitoring stations must be established. In the case of TSP and SO_2 if only one NAMS is needed, then category (a) must be used. The analysis and interpretation of data from NAMS should consider the distinction between these types of stations as appropriate.

The concept of NAMS is designed to provide data for national policy analyses/trends and for reporting to the public on major metropolitan areas. It is not the intent to monitor in every area where the NAAQS are violated. On the other hand, the data from SLAMS should be used primarily for nonattainment decisions/ analyses in specific geographical areas. Since the NAMS are stations from the SLAMS network, station locating procedures for NAMS are part of the SLAMS network design process.

3.1 *Total Suspended Particulates (TSP) Design Criteria for NAMS*

Table 2 indicates the approximate number of permanent stations needed in urban areas to characterize national and regional TSP air quality trends and geographical patterns. The criteria require that the number of stations in areas where urban populations exceed 500,000 and concentrations exceed the primary NAAQS range from 6 to 8 but in small urban areas, no more than two stations are required. A range of monitoring stations is specified in Table 2 because sources of pollutants and local control efforts can vary from one part of the country to another and therefore, some flexibility is allowed in selecting the actual number of stations in any one locale. For those cases where more than one station is required for an urban area, there should be at least one station for category (a) and category (b) objectives as discussed in Section 3. Where three or more stations are required, the mix of category (a) and (b) stations is determined on a case-by-case basis. The actual number of NAMS and their locations must be determined by EPA Regional Offices and the State agencies subject to the approval of EPA Headquarters (OANR). The EPA Headquarters approval is necessary to insure that individual stations conform to the NAMS selection criteria and the network as a whole is sufficient in terms of number and location for purposes of national analyses.

TABLE 2—TSP NATIONAL AIR MONITORING STATION CRITERIA (APPROXIMATE NUMBER OF STATIONS PER AREA) [1]

Population category	High concentration [2]	Medium concentration [3]	Low concentration [4]
High population, >500,000	6-8	4-6	0-2
Medium population, 100,000-500,000	4-6	2-4	0-2
Low population, 50,000-100,000	2-4	1-2	0

[1] Selection of urban areas and actual number of stations per area will be jointly determined by EPA and the State agency.
[2] High concentration—exceeding level of the primary NAAQS by 20 percent or more.
[3] Medium concentration—exceeding secondary NAAQS.
[4] Low concentration—less than secondary NAAQS.

The estimated number of TSP NAMS required nationwide will range from approximately 600 to 700. This range of stations is based on a statistical analysis of the data and computations of the probability of detecting certain rates of change over a specific number of years. An assumption was made that the variability of the data was 20 percent, i.e., a 95 percent confidence interval around the annual mean would be 20 percent. This assumption may be regarded as a "ballpark figure.". The sampling error from an every sixth-day schedule would be roughly 10 percent so an overall variability of 20 percent may be regarded as a reasonable approximation.

For TSP, it is unlikely that the same rate of change would apply throughout the nation. Regional differences in the TSP problem make it essential that the networks also be useful for regional trend assessments. In most practical applications, trends will be assessed on the basis of 3-5 years of data to minimize the impact of meteorological influences. With 60 to 70 sites in each geographical region, there is a reasonably good chance of detecting 3-year trends of more than 2 percent per year.

Using a TSP trend network of 600-700 stations there would be a reasonable chance of determining 5-year trends of more than 3 percent per year in the medium population cities with high TSP, but less than 50/50

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chance of detecting 3-year trends of less than 5 percent per year in any city. Therefore, the overall range of 600-700 TSP NAMS seems to be acceptable for the purposes of national and regional trends. The actual number of monitors in any specific area would depend on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvement or degradation. Generally, the greatest density of stations would occur in the northeastern States, where urban populations are large and where pollutant levels are high.

Generally, the worst air quality in an urban area should be used as the basis for determining the required number of TSP NAMS (see Table 2). This includes air quality levels, within populated parts of urbanized areas, that are affected by one or two point sources of particulates if the impact of the source(s) extends over a reasonably broad geographic scale (neighborhood or larger). Maximum air quality levels in remote unpopulated areas should be excluded as a basis for selecting TSP NAMS regardless of the sources affecting the concentration levels. Such remote areas are more appropriately monitored by SLAMS or SPM networks and/or characterized by diffusion model calculations as necessary.

3.2 *Sulfur Dioxide (SO_2) Design Criteria for NAMS*

As with TSP monitoring, it is desirable to have a greater number of NAMS in the more polluted and densely populated urban and multisource areas. The data in Table 3 show the approximate number of permanent stations needed in urban areas to characterize the national and regional SO_2 air quality trends and geographical patterns. These criteria require that the number of NAMS in areas where urban populations exceed 500,000 and concentrations also exceed the primary NAAQS may range from 6 to 8 and that in areas where the SO_2 problem is minor, only one or two (or no) monitors are required. For those cases where more than one station is required for an urban area, there should be at least one station for category (a) and category (b) objectives as discussed in Section 3. Where three or more stations are required, the mix of category (a) and (b) stations is determined on a case-by-case basis. The actual number and location of the NAMS must be determined by EPA Regional Offices and the State agency, subject to the approval of EPA Headquarters (OANR).

TABLE 3—SO_2 National Air Monitoring Station Criteria (Approximate Number of Stations Per Area) [1]

Population category	High concentration [2]	Medium concentration [3]	Low concentration [4]
High population, >500,000	6-8	4-6	0-2
Medium population, 100,000-500,000	4-6	2-4	0-2
Low population, 50,000-100,000	2-4	1-2	0

[1] Selection of urban areas and actual number of stations per area will be jointly determined by EPA and the State agency.
[2] High concentration—exceeding level of the primary NAAQS.
[3] Medium concentration—exceeding 60 percent of the level of the primary or 100 percent of the secondary NAAQS.
[4] Low concentration—less than 60 percent of the level of the primary or 100 percent of the secondary NAAQS.

The estimated number of SO_2 NAMS which would be required nationwide ranges from approximately 200 to 300. This range in the number of stations is less than for TSP. This is because there are more urban areas with high TSP levels than with high SO_2 levels. Also, the background air quality levels are higher for TSP than for SO_2, and thus air quality is more sensitive to SO_2 emission changes than for TSP. Therefore, fewer NAMS are needed on a national basis for SO_2 than for TSP. The actual number of stations in any specific area depends on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvements or degradation. The greatest density of stations should be where urban populations are large and where pollution levels are high. Fewer NAMS are necessary in the western States since concentrations are seldom above the NAAQS in their urban areas. Exceptions to this are in the areas where an expected shortage of clean fuels indicates that ambient air quality may be degraded by increased SO_2 emissions. In such cases, a minimum number of NAMS is required to provide EPA with a proper national perspective on significant changes in air quality.

Like TSP, the worst air quality in an urban area is to be used as the basis for determining the required number of SO_2 NAMS (see Table 3). This includes SO_2 air quality levels within populated parts of urbanized areas, that are affected by one or two point sources of SO_2 if the impact of the source(s) extends over a reasonably broad geographic scale (neighborhood or larger). Maximum SO_2 air quality levels in

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remote unpopulated areas should be excluded as a basis for selecting NAMS regardless of the sources affecting the concentration levels. Such remote areas are more appropriately monitored by SLAMS or SPM networks and/or characterized by diffusion model calculations as necessary.

3.3 *Carbon Monoxide (CO) Design Criteria for NAMS*

Information is needed on ambient CO levels in major urbanized areas where CO levels have been shown or inferred to be a significant concern. At the national level, EPA will not routinely require data from as many stations as are required for TSP, and perhaps, SO_2, since CO trend stations are principally needed to assess the overall air quality progress resulting from the emission controls required by the Federal motor vehicle control program (FMVCP).

Although State and local air programs may require extensive monitoring to document and measure the local impacts of CO emissions and emission controls, an adequate national perspective is possible with as few as two stations per major urban area. The two categories for which CO NAMS would be required are: (a) Peak concentration areas such as are found around major traffic arteries and near heavily traveled streets in downtown areas (micro scale); and (b) neighborhoods where concentration exposures are significant (neighborhood scale).

The peak concentration station (micro scale) is usually found near heavily traveled downtown streets (street canyons), but could be found along major arterials (corridors), either near intersections or at low elevations which are influenced by downslope drainage patterns under low inversion conditions. The peak concentration station should be located so that it is representative of several similar source configurations in the urban area, where the general population has access. Thus, it should reflect one of many potential peak situations which occur throughout the urban area. It is recognized that this does not measure air quality which represents large geographical areas. Thus, a second type of station on the neighborhood scale is necessary to provide data representative of the high concentration levels which exist over large geographical areas.

The neighborhood station (neighborhood scale) should be located in areas with a stable, high population density, projected continuity of neighborhood character, and high traffic density. The stations should be located where no major zoning changes, new highways, or new shopping centers are being considered. The station should be where a significant CO pollution problem exists, but not be under the influence of any one line source. Rather, it should be more representative of the overall effect of the sources in a significant portion of the urban area.

Because CO is generally associated with heavy traffic and population clusters, an urbanized area with a population greater than 500,000 is the principal criterion for identifying the urban areas for which pairs of NAMS for this pollutant will be required. The criterion is based on judgment that stations in urban areas with greater than 500,000 population would provide sufficient data for national analysis and national reporting to Congress and the public. Also, it has generally been shown that major CO problems are found in areas greater than 500,000 population.

3.4 *Ozone (O_3)* Design Criteria for NAMS

The criterion for selecting locations for ozone NAMS is any urbanized area having a population of more than 200,000. This population cut off is used since the sources of hydrocarbons are both mobile and stationary and are more diverse. Also, because of local and national control strategies and the complex chemical process of ozone formation and transport, more sampling stations than for CO are needed on a national scale to better understand the ozone problem. This selection criterion is based entirely on population and will include those relatively highly populated areas where most of the oxidant precursors originate.

Each urban area will generally require only two ozone NAMS. One station would be representative of maximum ozone concentrations (category (a), urban scale) under the wind transport conditions as discussed in section 2.5. The exact location should balance local factors affecting transport and buildup of peak O_3 levels with the need to represent population exposure. The second station (category (b), neighborhood scale), should be representative of high density population areas on the fringes of the central business district along the predominant summer/fall daytime wind direction. This latter station should measure peak O_3 levels under light and variable or stagnant wind conditions. Two ozone NAMS stations will be sufficient in most urban areas since spatial gradients for ozone generally are not as sharp as for other criteria pollutants.

3.5 *Nitrogen Dioxide (NO_2) Criteria for NAMS*

Nitrogen dioxide NAMS will be required in those areas of the country which have a population greater than 1,000,000. These areas will have two NO_2 NAMS. It is felt that stations in these major metropolitan areas would provide sufficient data for a national analysis of the data, and also because NO_2 problems occur in areas of greater than 1,000,000 population.

Within urban areas requiring NAMS, two permanent monitors are sufficient. The first station (category (a) neighborhood scale)

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would be to measure the photochemical production of NO_2 and would best be located in that part of the urban area where the emission density of NO_x is the highest. The second station (category (b) urban scale), would be to measure the NO_2 produced from the reaction of NO with O_3 and should be downwind of the area of peak NO_x emission areas.

3.6 *Lead (Pb) Design Criteria for NAMS.* In order to achieve the national monitoring objective, two of the SLAMS located in urbanized areas with populations greater than 500,000 will be designated as NAMS. One of the stations must be a microscale or middle scale category (a) station, located adjacent to a major roadway (30,000 ADT) or near the roadway with the largest traffic volume if the volume is less than 30,000 ADT. A microscale location is preferred, but a middle scale is also acceptable if a suitable microscale location cannot be found.

The second station must be a neighborhood scale category (b) station located in a highly populated residential section of the urbanized area where traffic density is high, preferably (30,000 ADT) or near the roadway with the largest traffic volume if the volume is less than 30,000 ADT.

In certain urbanized areas greater than 500,000 population, point sources may have a significant impact on air quality lead levels in populated areas. To measure the impact of such sources, other monitors in the SLAMS network would normally be used.

4. Summary

Table 4 shows by pollutant, all of the spatial scales that are applicable for SLAMS and the required spatial scales for NAMS. There may also be some situations, as discussed later in Appendix E, where additional scales may be allowed for NAMS purposes.

Table 4—*Summary of Spatial Scales for SLAMS and Required Scales for NAMS*

Spatial scale	Scales applicable for SLAMS						Scales required for NAMS					
	TSP	SO_2	CO	O_3	NO_2	Pb	TSP	SO_2	CO	O_3	NO_2	Pb
Micro			√			√			√			√
Middle	√	√	√	√	√	√						√
Neighborhood	√	√	√	√	√	√	√	√	√	√	√	√
Urban	√	√		√	√	√				√	√	
Regional	√	√		√		√						

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Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

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1. Introduction

This appendix contains probe siting criteria to be applied to ambient air quality monitors or monitor probes after the general station location has been selected based on the monitoring objectives and spatial scale of representativeness as discussed in Appendix D of this part. Adherence to these siting criteria is necessary to ensure the uniform collection of compatible and comparable air quality data.

The probe siting criteria as discussed below must be followed to the maximum extent possible. It is recognized that there may be situations when the probe siting criteria cannot be followed. If the siting criteria cannot be met, this must be thoroughly documented with a written request for a waiver which describes how and why the siting criteria differs. This documentation should help to avoid later questions about the data. Conditions under which EPA would consider an application for waiver from these siting criteria are discussed in Section 9 of this appendix.

The spatial scales of representativeness used in this appendix, i.e., micro, middle, neighborhood, urban, and regional are defined and discussed in Appendix D of this part. The pollutant specific probe siting criteria generally apply to all spatial scales except where noted otherwise. Specific siting criteria that are prefaced with a "must" are defined as a requirement and exceptions must be approved through the waiver provisions. However, siting criteria that are prefaced with a "should" are defined as a goal to meet for consistency but are not a requirement.

2. Total Suspended Particulates (TSP)

2.1 *Vertical Placement*

The most desirable height for a TSP monitor is near the breathing zone. Practical considerations such as prevention of vandalism, security, accessibility, availability of electricity, etc., require that the sampler be elevated and that a range of acceptable heights be specified. For TSP, the air intake for a TSP monitor must be located 2 to 15 meters above ground level. The lower limit was based on a compromise between ease of servicing the sampler and the desire to avoid reentrainment from dusty surfaces. The upper limit represents a compromise between the desire to have measurements which are most representative of population exposures, and the consideration for the location of existing monitors.

2.2 *Spacing from Obstructions*

If the sampler is located on a roof or other structure, then there must be a minimum of 2 meters separation from walls, parapets, penthouses, etc. No furnace or incineration flues should be nearby. This separation distance from flues is dependent on the height of the flues, type of waste or fuel burned, and quality of the fuel (ash content). For example, if the emissions from the chimney are the result of natural gas combustion, no special precautions are necessary except for the avoidance of obstructions, i.e., at least 2 meters separation.

On the other hand, if fuel oil, coal, or solid waste is burned and the stack is sufficiently short so that the plume could reasonably be expected to impact on the sampler intake a significant part of the time, other buildings/locations in the area that are free from these types of sources should be considered for sampling. Trees provide surfaces for particulate deposition and also restrict airflow. Therefore, the sampler

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should be placed at least 20 meters from trees.

The sampler must also be located away from obstacles such as buildings, so that the distance between obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler. Sampling stations that are located closer to obstacles than this criterion allows should not be classified as neighborhood, urban, or regional scale, since the measurements from such a station would closely represent middle scale stations. Therefore, stations not meeting the criterion should be classified as middle scale. There must also be unrestricted airflow in an arc of at least 270° around the sampler, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc.

2.3 *Spacing from Roads*

A number of studies [1-8] support the conclusion that TSP concentrations decrease with increasing height of the monitor and distance from roads. Quite high concentrations have been reported at monitors located at a low elevation close to heavily traveled roads. Moreover, monitors located close to streets are within the concentrated plume of particulate matter emitted and generated by vehicle traffic. Except for situations where the monitoring objective is to determine the impact of a single source, ambient monitors should not be located so as to measure the plume of a single source. NAMS would not be located to measure the impact of one or two point sources if the impact only extends over a geographic scale smaller than a neighborhood scale. For TSP, it is appropriate that ambient monitors be located beyond the concentrated particulate plume generated by traffic, and not so close that the roadway totally dominates the measured ambient concentration.

An analysis of various monitoring studies [9] shows that a linear relationship between sampler height and distance from roadways defines a zone where the plume generated by traffic greater than approximately 3,000 vehicles per day is diminished. Figure 1 illustrates this relationship by showing two zones where TSP SLAMS could be located. Zone A represents locations which are recommended for the neighborhood, urban and regional scales and also for most middle scale locations. Zone B represents locations which should be avoided in order to minimize undesirable roadway influences.

Because of the pronounced TSP air quality gradients generally expected near roadways, SLAMS which for certain reasons cannot be located in Zone A and are located in Zone B would be classified as having a middle scale of representativeness. NAMS must be located in Zone A, and it is recommended that most SLAMS be located in Zone A.

[1-8] See references at end of this Appendix.

[9] See References at end of this Appendix.

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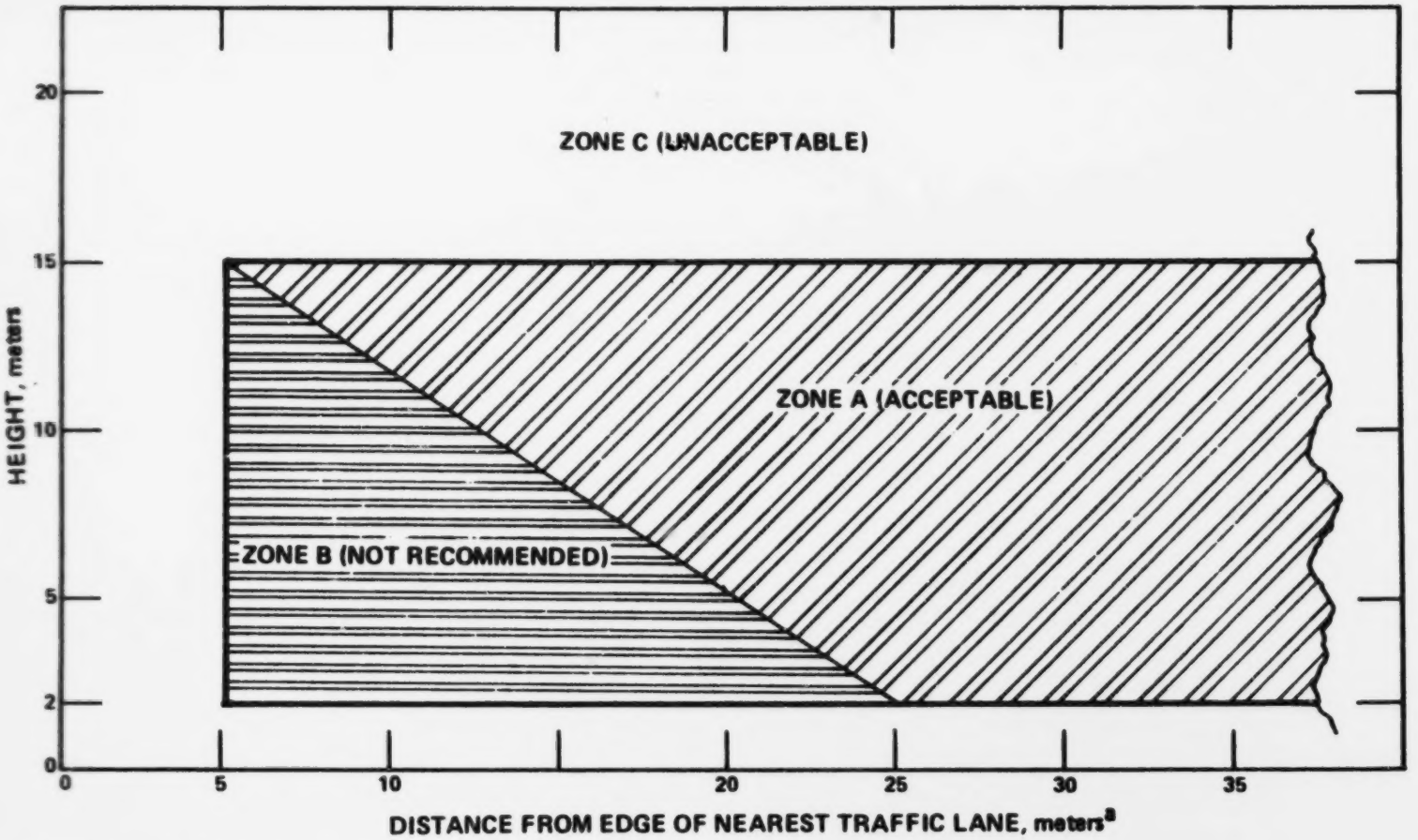

[a]APPLIES WHERE ADT >3 000

Figure I. Acceptable zone for siting TSP monitors.

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In light of several street canyon studies cited above, it appears that the street canyon may confine resuspended roadway dust and may not be a suitable location for ambient monitors. However, since roads with lower traffic (less than approximately 3,000 vehicles per day) generally do not generate a concentrated particulate plume, monitors located in Zone B should not be adversely influenced. Therefore, for those cases where the traffic is less than approximately 3,000 vehicles per day, the monitor must be located greater than 5 meters from the edge of the nearest traffic lane and 2 to 15 meters above ground level (either Zone A or Zone B).

In the case of elevated roadways where the monitor must be placed below the level of the roadway, then the monitor should be located no closer than approximately 25 meters from the edge of the nearest traffic lane. This separation distance applies for those situations where the road is elevated greater than 5 meters above the ground level, and applies to all traffic volumes.

2.4 *Other Considerations*

Stations should not be located in an unpaved area unless there is vegetative ground cover year round so that the impact of reentrained or fugitive dusts will be kept to a minimum. Addtional information on TSP probe siting may be found in reference 10.

3. Sulfur Dioxide (SO_2)

3.1 *Horizontal and Vertical Probe Placement*

As with TSP monitoring, the most desirable height for an SO_2 monitor inlet probe is near the breathing height. Various factors enumerated before may require that the inlet probe be elevated. Therefore, the inlet probe must be located 3 to 15 meters above ground level. If the inlet probe is located on the side of a building, then it should be located on the windward side of the building relative to the prevailing winter wind direction. The inlet probe must also be located more than 1 meter vertically or horizontally away from any supporting structure and also away from dirty, dusty areas.

3.2 *Spacing from Obstructions*

No furnace or incineration flues, or other minor sources of SO_2 should be nearby. The separation distance is dependent on the height of the flues, type of waste or fuel burned, and the quality of the fuel (sulfur content). If the inlet probe is located on a roof or other structure, it must be at least 1 meter from walls, parapets, penthouses, etc.

The inlet probe should be placed more than 20 meters from trees and must be located away from obstacles and buildings. The distance between the obstacles and the inlet probe must be at least twice the height that the obstacle protrudes above the inlet probe. Sampling stations that are located closer to obstacles than this criterion allows should not be classified as a neighborhood scale, since the measurements from such a station would closely represent middle scale stations. Therefore, stations not meeting the criterion should be classified as middle scale. Airflow must also be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required. Additional information on SO_2 probe siting criteria may be found in reference 11.

4. Carbon Monoxide (CO)

4.1 *Horizontal and Vertical Probe Placement*

Because of the importance of measuring population exposure to CO concentrations, air should be sampled at average breathing heights. However, practical factors require that the inlet probe be higher. The required height of the inlet probe for CO monitoring is therefore $3 \pm \frac{1}{2}$ meter for a microscale site, which is a compromise between representative breathing height and prevention of vandalism. The recommended 1 meter range of heights is also a compromise to some extent. For consistency and comparability, it would be desirable to have all inlets at exactly the same height, but practical considerations often prevent this. Some reasonable range must be specified and 1 meter provides adequate leeway to meet most requirements.

For the middle and neighborhood scale stations, the vertical concentration gradients are not as great as for the microscale station. This is because the diffusion from roads is greater and the concentrations would represent larger areas than for the microscale. Therefore, the required height of the inlet probe is 3 to 15 meters for middle and neighborhood scale stations. The inlet probe must be located more than 1 meter in the vertical or horizontal direction from any supporting structure.

4.2 *Spacing from Obstructions*

Airflow must also be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required.

4.3 *Spacing from Roads*

Street canyon and traffic corridor stations (microscale) are intended to provide a measurement of the influence of the immediate source on the pollution exposure of the population. In order to provide some reasonable consistency and comparability in the air quality data from such stations, a minimum distance of 2 meters and a maximum distance of 10 meters from the edge of the

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nearest traffic lane must be maintained for these CO monitor inlet probes. This should give consistency to the data, yet still allow flexibility of finding suitable locations.

Street canyon/corridor (microscale) inlet probes must be located at least 10 meters from an intersection and preferably at a midblock location. Midblock locations are preferable to intersection locations because intersections represent a much smaller portion of downtown space than do the streets between them. Pedestrian exposure is probably also greater in street canyon/corridors than at intersections. Finally, the practical difficulty of positioning sampling inlets is less at midblock locations than at the intersection.

In determining the minimum separation between a neighborhood scale monitoring station and a specific line source, the presumption is made that measurements should not be unduly influenced by any one roadway. Computations were made to determine the separation distances, and table 1 provides the required minimum separation distance between roadways and neighborhood scale stations. Sampling stations that are located closer to roads than this criterion allows should not be classified as a neighborhood scale, since the measurements from such a station would closely represent the middle scale. Therefore, stations not meeting this criterion should be classified as middle scale. In some cases, such a monitoring station would be acceptable for SLAMS purposes, but not NAMS since no middle scale NAMS stations are required. Additional information on CO probe siting may be found in reference 12.

TABLE 1—MINIMUM SEPARATION DISTANCE BETWEEN NEIGHBORHOOD SCALE CO STATIONS AND ROADWAYS (EDGE OF NEAREST TRAFFIC LANE)

Roadway average daily traffic, vehicles per day	Minimum separation distance between stations and roadways, meters
10,000	[1]>10
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
>60,000	>150

[1]Distances should be interpolated based on traffic flow.

5. OZONE (O_3)

5.1 *Vertical and Horizontal Probe Placement*

The inlet probe for ozone monitors should be as close as possible to the breathing zone. The complicating factors discussed previously, however, require that the probe be elevated. The height of the inlet probe must be located 3 to 15 meters above ground level. The probe must also be located more than 1 meter vertically or horizontally away from any supporting structure.

5.2 *Spacing from Obstructions*

The probe must be located away from obstacles and buildings such that the distance between the obstacles and the inlet probe is at least twice the height that the obstacle protrudes above the sampler. The probe should also be located at least 20 meters from trees. Since the scavenging effect of trees is greater for ozone than for TSP, SO_2, CO, and NO_2, strong consideration should be used in locating the inlet probe to avoid this effect. Airflow must be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required.

5.3 *Spacing from Roads*

It is important in the probe siting process to minimize destructive interferences from sources of nitric oxide (NO) since NO readily reacts with ozone. Table 2 provides the required minimum separation distances between roadways and ozone monitoring stations. These distances were based on recalculations using the methodology in reference 13 and validated using more recent ambient data collected near a major roadway. Sampling stations that are located closer to roads than this criterion allows should not be classified as neighborhood or urban scale, since the measurements from such stations would more closely represent the middle scale. Accordingly, such stations should be classified as middle scale. In some cases, a middle scale station would be acceptable for SLAMS purposes, but not for NAMS since no middle scale NAMS are required. The minimum separation distance must also be maintained between an ozone station and other similar volumes of automotive traffic, such as parking lots. Additional information on ozone probe siting criteria may be found in reference 13.

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TABLE 2—MINIMUM SEPARATION DISTANCE BETWEEN NEIGHBORHOOD AND URBAN SCALE OZONE STATIONS AND ROADWAYS (EDGE OF NEAREST TRAFFIC LANE)

Roadway average daily traffic, vehicles per day	Minimum separation distance between roadways and stations, meters
≤10,000	[1]>10
15,000	20
20,000	30
40,000	50
70,000	100
≤110,000	>250

[1]Distances should be interpolated based on traffic flow.

6. NITROGEN DIOXIDE (NO_2)

6.1 *Vertical and Horizontal Probe Placement*

The height of the NO_2 inlet probe must be 3 to 15 meters above the ground. This is a compromise between measuring in the breathing zone and avoidance of vandalism, finding suitable sites, etc. For NO_2, the height does not appear to be a critical factor since the NO_2 should be fairly well mixed and somewhat uniform in the vertical direction. The distance of the inlet probe from any supporting structure must be greater than 1 meter vertically or horizontally.

6.2 *Spacing from Obstructions*

Buildings, trees, and other obstacles may possibly scavenge NO_2. In order to avoid this kind of interference, the station must be located well away from such obstacles so that the distance between obstacles and the inlet probe is at least twice the height that the obstacle protrudes above the probe. Sampling stations that are located closer to obstacles than this criterion allows should not be classified in the neighborhood or urban scales, since the measurements from such stations would more closely represent the middle scale. Such stations should be classified as middle scale. For similar reasons, a probe inlet along a vertical wall is undesirable because air moving along that wall may be subject to possible removal mechanisms. The inlet probe should also be at least 20 meters from trees. There must be unrestricted airflow in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of the building, 180° clearance is required.

6.3 *Spacing from Roads*

It is important that the monitoring probe be removed from oxides of nitrogen sources to avoid measurements being dominated by any one source and to allow time for conversion (reactions) of NO emissions to NO_2. Further, the effects of roadway sources must be minimized by using separation distances for neighborhood and urban scale stations found in Table 3. These distances were based on recalculations using the methodology in reference 13 and validated using more recent ambient data collected near a major roadway. The minimum separation distance must also be maintained between an NO_2 probe and any other similar volume of automotive traffic such as parking lots. Sampling stations that are located closer to roads than this criterion allows should not generally be classified as neighborhood or urban scales, since the measurements from such stations would more closely represent middle scale stations. Such stations should generally be classified as middle scale. In some cases, such a monitoring station would be acceptable for SLAMS purposes, but not for NAMS since no middle scale NAMS are acceptable. Additional information on NO_2 probe siting criteria may be found in reference 13.

TABLE 3—MINIMUM SEPARATION DISTANCE BETWEEN NEIGHBORHOOD AND URBAN SCALE NO_2 STATIONS AND ROADWAYS (EDGE OF NEAREST TRAFFIC LANE)

Roadway average daily traffic, vehicles per day	Minimum separation distance between roadways and station, meters
≤10,000	[1]>10
15,000	20
20,000	30
40,000	50
70,000	100
≤110,000	>250

[1]Distances should be interpolated based on traffic flow.

7. *Lead (Pb).*

7.1 *Vertical placement.* Several studies (*5, 14-15*) on the relationship between roadway placement of lead samplers and measured ambient concentrations do not typically indicate large gradients within the first 6 to 7 meters above ground level. Similar to monitoring for other pollutants, optimal placement of the sampler inlet for lead monitoring should be at breathing height level. However, practical factors such as prevention of vandalism, security, and safety precautions must also be considered when siting a lead monitor. Given these considerations, the sampler inlet for microscale lead monitors must be 2-7 meters above ground level. The lower limit was based on a compromise between ease of servicing the sampler and the desire to avoid unrepresentative conditions due to re-entrainment from

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dusty surfaces. The upper limit represents a compromise between the desire to have measurements which are most representative of population exposures and a consideration of the practical factors noted above.

For middle or larger spatial scales, increased diffusion results in vertical concentration gradients which are not as great as for the small scales. Thus, the required height of the air intake for middle or larger scales is 2-15 meters.

7.2 *Spacing from Obstructions.* The sampler should be placed at least 20 meters from trees, since trees absorb particles as well as restrict airflow. The sampler must be located away from obstacles such as buildings, so that the distance between obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler.

A minimum of 2 meters of separation from walls, parapets, and penthouses is required for rooftop samplers. No furnace or incinerator flues should be nearby. The height and type of flues and the type, quality, and quantity of waste or fuel burned determine the separation distances. For example, if the emissions from the chimney have high lead content and there is a high probability that the plume would impact on the sampler during most of the sampling period, then other buildings/locations in the area that are free from the described sources should be chosen for the monitoring site.

There must be unrestricted airflow in an arc of at least 270° around the sampler. Since the intent of the category (a) site is to measure the maximum concentrations from a road or point source, there must be no significant obstruction between a road or point source and the monitor, even though other spacing from obstruction criteria are met. The predominant direction for the season with the greatest pollutant concentration potential must be included in the 270° arc.

7.3 *Spacing from Roadways.* Numberous studies have shown that ambient lead levels near mobile source are a function of the traffic volume and are most pronounced at ADT ≥30,000 within the first 15 meters, on the downwind side of the roadways. (1, 16-19) Therefore, stations to measure the peak concentration from mobile sources should be located at the distance most likely to produce the highest concentrations. For the microscale station, the location must be between 5 and 15 meters from the major roadway. For the middle scale station, a range of acceptable distances from the major roadway is shown in Table 4. This table also includes separation distances between a roadway and neighborhood or larger scale stations. These distances are based upon the data of reference 16 which illustrates that lead levels remain fairly constant after certain horizontal distances from the roadway. As depicted in the above reference, this distance is a function of the traffic volume.

Table 4.—*Separation Distance Between Pb Stations and Roadways (Edge of Nearest Traffic Lane)*

Roadway average daily traffic vehicles per day	Separation distance between roadways and stations, meters		
	Micro-scale	Middle scale	Neighborhood urban regional scale
≤10,000	5-15	[1]>15-50	[1]>50
20,000	5-15	>15-75	>75
≥40,000	5-15	>15-100	>100

[1]Distances should be interpolated based on traffic flow.

8. Probe Material and Pollutant Sample Residence Time

For the reactive gases, SO_2, NO_2, and O_3, special probe material must be used. Studies [20-24] have been conducted to determine the suitability of materials such as polypropylene, polyethylene, polyvinylchloride, tygon, aluminum, brass, stainless steel, copper, pyrex glass and teflon for use as intake sampling lines. Of the above materials, only pyrex glass and teflon have been found to be acceptable for use as intake sampling lines for all the reactive gaseous pollutants. Furthermore, EPA[25] has specified borosilicate glass or FEP teflon as the only acceptable probe materials for delivering test atmospheres in the determination of reference or equivalent methods. Therefore, borosilicate glass, FEP teflon, or their equivalent must be used for existing and new NAMS or SLAMS.

No matter how nonreactive the sampling probe material is initially, after a period of use reactive particulate matter is deposited on the probe walls. Therefore, the time it takes the gas to transfer from the probe inlet to the sampling device is also critical. Ozone in the presence of NO will show significant losses even in the most inert probe material when the residence time exceeds 20 seconds.[26] Other studies [27-28] indicate that a 10-second or less residence time is easily achievable. Therefore, sampling probes for reactive gas monitors at SLAMS or NAMS must have a sample residence time less than 20 seconds.

9. Waiver Provisions

It is believed that most sampling probes or monitors can be located so that they meet the requirements of this appendix. New sta-

[20-28]See References at end of this Appendix.

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tions with rare exceptions, can be located within the limits of this appendix. However, some existing stations may not meet these requirements and yet still produce useful data for some purposes. EPA will consider a written request from the State Agency to waive one or more siting criteria for some monitoring stations providing that the State can adequately demonstrate the need (purpose) for monitoring or establishing a monitoring station at that location. For establishing a new station, a waiver may be granted only if both of the following criteria are met:

• The site can be demonstrated to be as representative of the monitoring area as it would be if the siting criteria were being met.

• The monitor or probe cannot reasonably be located so as to meet the siting criteria because of physical constraints (e.g., inability to locate the required type of station the necessary distance from roadways or obstructions).

However, for an existing station, a waiver may be granted if either of the above criteria are met.

Cost benefits, historical trends, and other factors may be used to add support to the above, however, they in themselves, will not be acceptable reasons for granting a waiver. Written requests for waivers must be submitted to the Regional Administrator. For those SLAMS also designated as NAMS, the request will be forwarded to the Administrator.

10. Discussion and Summary

Table 5 presents a summary of the requirements for probe-siting criteria with respect to distances and heights. It is apparent from Table 5 that different elevation distances above the ground are shown for the various pollutants. The discussion in the text for each of the pollutants described reasons for elevating the monitor or probe. The differences in the specified range of heights are based on the vertical concentration gradients. For CO, the gradients in the vertical direction are very large for the microscale, so a small range of heights has been used. The upper limit of 15 meters was specified for consistency between pollutants and to allow the use of a single manifold for monitoring more than one pollutant.

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Table 5—*Summary of probe siting criteria*

Pollutant	Scale	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
			Vertical	Horizontal[a]	
TSP	All	2–15	—	>2	1. Should be >20 meters from trees. 2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler.[b] 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby.[c] 5. Must have minimum spacing from roads. This varies with height of monitor and spatial scale (see Figure 1).
SO_2	All	3–15	>1	>1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe.[b] 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. No furnace or incineration flues should be nearby.[c]
CO	Micro	3±½	>1	>1	1. Must be >10 meters from intersection and should be at midblock location. 2. Must be 2–10 meters from edge of nearest traffic lane. 3. Must have unrestricted airflow 180° around the inlet probe.
	Middle, neighborhood	3–15	>1	>1	1. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 2. Spacing from roads varies with traffic (see Table 1).
O_3	All	3–15	>1	>1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic (see Table 2).
NO_2	All	3–15	>1	>1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe.[b] 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic (see Table 3).
Pb	Micro	2–7	—	>2	1. Should be >20 meters from trees. 2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby.[c] 5. Must be 5 to 15 meters from major roadway.

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Table 5—*Summary of probe siting criteria*—Continued

Pollutant	Scale	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
			Vertical	Horizontal[a]	
Pb—Cont.	Middle, neighborhood, urban, and regional.	2–15	—	>2	1. Should be >20 meters from trees. 2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby.[c] 5. Spacing from roads varies with traffic (see Table 4).

[a] When probe is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.
[b] Sites not meeting the criterion would be classified as middle scale (see text).
[c] Distance is dependent on height of furnace or incineration flue, type of fuel or waste burned, and quality of fuel (sulfur, ash, or lead content). This is to avoid undue influences from minor pollutant sources.

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[44 FR 27571, May 10, 1979; 44 FR 72592, Dec. 14, 1979, as amended at 46 FR 44170, Sept. 3, 1981]

Appendix F—Annual SLAMS Air Quality Information

1. General
2. Required information
2.1 Sulfur Dioxide (SO_2)
2.1.1 Site and Monitoring Information
2.1.2 Annual Summary Statistics
2.2 Particulates (TSP)
2.2.1 Site and Monitoring Information
2.2.2 Annual Summary Statistics
2.3 Carbon Monoxide (CO)
2.3.1 Site and Monitoring Information
2.3.2 Annual Summary Statistics
2.4 Nitrogen Dioxide (NO_2)
2.4.1 Site and Monitoring Information
2.4.2 Annual Summary Statistics
2.5 Ozone(O_3)
2.5.1 Site and Monitoring Information
2.5.2 Annual Summary Statistics
2.6 Lead (Pb).
2.6.1 Site and Monitoring Information.
2.6.2 Annual Summary Statistics.

1. General

This appendix describes information to be compiled and submitted annually to EPA for each ambient monitoring station in the SLAMS Network in accordance with § 58.26. The annual summary statistics that are described in section 2 below shall be construed as only the minimum necessary statistics needed by EPA to overview national air quality status. They will be used by EPA to convey information to a variety of interested parties including environmental groups, Federal agencies, the Congress, and private citizens upon request. As the need arises, EPA may issue modifications to these minimum requirements to reflect changes in EPA policy concerning the National Ambient Air Quality Standards (NAAQS).

As indicated in § 58.26(c), the contents of the SLAMS annual report shall be certified by the senior air pollution control officer in the State to be accurate to the best of his knowledge. In addition, the manner in which the data were collected must be certified to have conformed to the applicable quality assurance, air monitoring methodology, and probe siting criteria given in Appendices A, C, and E to this part. A certified statement to this effect must be included with the annual report. As required by § 58.26(a), the report must be submitted by July 1 of each year for data collected during the period January 1 to December 31 of the previous year.

EPA recognizes that most air pollution control agencies routinely publish air quality statistical summaries and interpretive reports. EPA encourages State and local agencies to continue publication of such reports and recommends that they be expanded, where appropriate, to include analysis of air quality trends, population exposure, and pollutant distributions. At their discretion, State and local agencies may wish to integrate the SLAMS report into routine agency publications.

2. Required Information

This paragraph describes air quality monitoring information and summary statistics which must be included in the SLAMS annual report. The required information is itemized below by pollutant. Throughout this appendix, the time of occurrence refers to the ending hour. For example, the ending hour of an 8-hour CO average from 12:01 a.m. to 8:00 a.m. would be 8:00 a.m.

2.1 *Sulfur Dioxide* (SO_2)

2.1.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations. (*1*) Number of daily observations. (*2*)

2.1.2 *Annual Summary Statistics.* Annual arithmetic mean (ppm). Highest and second highest 24-hour averages (*3*) (ppm) and dates of occurrence. Highest and second highest 3-hour averages (*1, 3*) (ppm) and dates and times (*1*) (ending hour) of occurrence. Number of exceedances of the 24-hour primary NAAQS. (*3*) Number of exceedances of the 3-hour secondary NAAQS. (*3*) Number of 24-hour average concentrations (*4*) in ranges:

Range	Number of values
0.00 to 0.04 (ppm)	
0.05 to 0.08	

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Range	Number of values
0.09 to 0.12	
0.13 to 0.16	
0.17 to 0.20	
0.21 to 0.24	
0.25 to 0.28	
Greater than .28	

2.2 *Particulates* (TSP)

2.2.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. Number of daily observations.

2.2.2 *Annual Summary Statistics.* Annual geometric mean ($\mu g/m^3$). Highest and second highest daily values and dates of occurrence. Number of exceedances of the 24-hour primary NAAQS. Number of exceedances of the 24-hour secondary NAAQS. Number of 24-hour average concentrations in ranges:

Range	Number of values
0 to 65 ($\mu g/m^3$)	
66 to 130	
131 to 195	
196 to 260	
261 to 325	
326 to 390	
391 to 455	
Greater than 455	

2.3 *Carbon Monoxide* (CO)

2.3.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations.

2.3.2 *Annual Summary Statistics.* Highest and second highest 1-hour values (ppm) and date and time of occurrence. Highest and second highest 8-hour averages (*3*) (ppm) and date and time of occurrence (ending hour). Number of exceedances of the 1-hour primary NAAQS. Number of exceedances of the 8-hour average primary NAAQS. (*3*) Number of 8-hour average concentrations (*4*) in ranges:

Range	Number of values
0 to 4 (ppm)	
5 to 8 (ppm)	
9 to 12	
13 to 16	
17 to 20	
21 to 24	
25 to 28	
Greater than 28	

2.4 *Nitrogen Dioxide* (NO_2)

2.4.1 *Site and Monitoring Information.* City name (when applicable), county name, and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations. (*1*) Number of daily observations. (*2*)

2.4.2 *Annual Summary Statistics.* Annual arithmetic mean (ppm). Highest and second highest hourly averages (*3*) (ppm) and their dates and time of occurrence. Highest and second highest 24-hour averages (*2*) and their date of occurrence (ppm). Number of hourly average concentrations in ranges. (*1*)

Range	Number of values
.0 to .04 (ppm)	
.05 to .08	
.09 to .12	
.13 to .16	
.17 to .20	
.21 to .24	
.25 to .28	
Greater than 0.28	

2.5 *Ozone* (O_3)

2.5.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations.

2.5.2 *Annual Summary Statistics.* Four highest daily maximum hour values (ppm) and their dates and time of occurrence. Number of exceedances of the daily maximum 1-hour primary NAAQS. Number of daily maximum hour concentrations in ranges:

Range	Number of values
0 to .04 (ppm)	
.05 to .08	
.09 to .12	
.13 to .16	
.17 to .20	
.21 to .24	
.25 to .28	
Greater than .28	

2.6 *Lead* (*Pb*).

2.6.1 *Site and Monitoring Information*—City name (when applicable), county name, and street address of site location, SAROAD site code. SAROAD monitoring method code. Sampling interval of submitted data, e.g., twenty-four hour or quarterly composites.

2.6.2 *Annual Summary Statistics*—The four quarterly arithmetic averages given to two decimal places for the year together with the number of twenty-four hour samples included in the average, as in the following format:

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Quarter	Number of 24-hour samples	Quarterly arithmetic average ($\mu g/m^3$)
Jan.–March		
April–June		
July–Sept.		
Oct.–Dec.		

FOOTNOTES

1. Continuous methods only.
2. Manual or intermittent methods only.
3. Based on nonoverlapping values computed according to procedures described in reference (1) or on individual intermittent measurements.
4. Based on overlapping running averages for continuous measurements as described in reference (1) or on individual measurement for intermittent methods.

REFERENCE

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[44 FR 27571, May 10, 1979, as amended at 46 FR 44171, Sept. 3, 1981]

APPENDIX G—UNIFORM AIR QUALITY INDEX AND DAILY REPORTING

1 General.
2. Definitions.
3. Monitoring data.
4. Geographic applicability.
5. Daily index report.
6. Prominent public notice.
7. Uniform air quality index.
7.1 Uniform index computation.
7.2 Example computation.
8. Exceptions.
9. Reporting agency recordkeeping.
10. Basis for PSI.
11. Additional information.
12. References.

1. GENERAL

This appendix describes the uniform air quality index to be used by States in reporting the daily air quality index required by § 58.40.

2. DEFINITIONS

a. The uniform air quality required for the daily reporting of air quality is a modified form of the Pollutant Standards Index (PSI).

b. "Reporting agency" means the applicable State agency or, in metropolitan areas, a local air pollution control agency designated by the State to carry out the provisions of § 58.40.

c. "Reporting area" means the geographical area for which the daily index is representative for the reporting period. This area(s) may be the total urban area (or subpart thereof) or each of any number of distinct geographical subregions of the urban area deemed necessary by the reporting agency for adequate presentation of local air quality conditions.

d. "Reporting day" means the calendar day during which the daily report is given.

e. "Reporting period" means the time interval for which the daily report is representative. Normally, the reporting period is the 24-hour period immediately preceding the time of the report and should coincide to the extent practicable with the reporting day. In cases where the index will be forecasted the reporting period will include portions of the reporting day for which no monitoring data are available at the time of the report.

f. "Critical pollutant" means the pollutant or pollutant combination (TSP x SO_2) with the highest subindex during the reporting period.

g. "Subindex" means the calculated index value for a single pollutant as described in section 7.

3. MONITORING DATA

The monitoring data used to prepare the daily index report must be based on data obtained from the SLAMS network (or portions thereof) required under 40 CFR 58.20. Air quality measurements need not be made on reporting days for which the agency does not ordinarily schedule monitoring to occur. For example, TSP measurements are to be included in the index calculations on days for which data are required (minimum of one sample per 6 days), but may be excluded on other days. Particulate measurements from samplers other than the hi-volume sampler, may be included in index calculations provided such measurements can be quantitatively related to hi-volume measurements.

Data used to calculate the daily index (and respective subindices) should come from the most recent sampling period. The index should be based on data obtained during the 24-hour period for which the index is reported. No monitoring data are to be used for index calculations for which the end of the sampling period precedes the reporting day by more than 24-hours. To the extent practicable, agencies should forecast the index using whatever procedures are most accurate and reasonable through consideration of local meteorological and topographical conditions and the availability of data and forecasting expertise.

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4. Geographic Applicability

Generally, the area contained within the geographic boundaries of the urban area is sufficient for purposes of calculating and reporting the index. The exception occurs in cases where a significant air quality problem exists (PSI greater than 100) in highly populated areas adjacent to, but outside of, the urban area. For example, ozone concentrations are often highest downwind and outside the urban area.

Agencies should report a separate air quality index for each subregion of the urban area which is likely to have air quality significantly different from other portions of the urban area if such data are readily available. At a minimum, the subregion subject to the highest index values shall be included in the index computation. This subregion shall be selected by the reporting agency after past air quality has been reviewed to determine which monitoring stations typically record the highest pollutant concentrations.

5. Daily Index Report

The daily index report must be based on the uniform air quality index described in section 7 and contain the following information: (1) The reporting area(s); (2) the reporting period; (3) the critical pollutant; (4) the subindex corresponding to the critical pollutant; and (5) the descriptor word according to the following system:

Index Range and Descriptor Category

0 to 50	"Good"
51 to 100	"Moderate"
101 to 199	"Unhealthful"
200 to 299	"Very Unhealthful"
300 and above	"Hazardous"

Reporting agencies should, at their discretion, report additional information such as the following: (1) Pollutants other than the critical pollutants and their individual subindices; (2) subindices and respective pollutant names for each of a number of distinct reporting areas within the urban area; (3) actual pollutant concentration values; and (4) causes for unusual PSI readings, such as high background air quality levels and other natural phenomena.

6. Prominent Public Notice

The reporting agency shall make prominent public notice of the daily index report on at least 5 days per week. Prominent public notification consists of at a minimum: (1) Furnishing the daily report to one or more of the appropriate news media (radio, television, newspapers); and (2) making the daily index report publicly available at one or more places of public access. Index reports also may be disseminated by means of recorded messages.

7. Uniform Air Quality Index

The uniform index is based on the pollutants standards index (PSI) structure (see section 10), which includes the five pollutants for which primary National Ambient Air Quality Standards (NAAQS) have been established. These pollutants are: Total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and nitrogen dioxide (NO_2). For each pollutant, a subindex is calculated from a segmented linear function that transforms ambient concentrations onto a scale extending from 0 through 500, with 100 corresponding to the primary NAAQS concentrations and 500 corresponding to the significant harm levels established in § 51.16 of this chapter. In order to achieve relative uniformity for intermediate PSI values of 200, 300, and 400 among the several pollutants, their effects were approximately normalized by using the breakpoints corresponding to the Alert, Warning and Emergency levels in the example episode criteria. (1) However, because many factors, including meteorological conditions, are taken into account before triggering episode control actions, the reported PSI values and the calling of an episode do not always correspond. It should be recognized that over time with new information on effects, the actual concentrations corresponding to the PSI values may change. The PSI values themselves and their health implications, however, should remain the same. Similarly, concentrations and conditions leading to administrative episode actions may change.

In addition to the five health-related pollutants, a subindex is calculated for the product TSP x SO_2 because it has both Federal episode criteria and a significant harm level. The breakpoint used in defining each of the six pollutant subindices are listed in gravimetric units (Table 1) and in volumetric units (Table 2). The individual computational scheme is defined below for calculating the pollutant subindex values.

7.1 Uniform Index Computation

Each subindex i, is calculated by using a segmented linear function (Figures 1-6) that relates pollutant concentration, X_i, to subindex value, I_i. A segmented linear function consists of straight-line segments joining discrete coordinates (i.e., breakpoints). For pollutant i and segment j, the coordinates of the jth breakpoint are represented by subindex value $I_{i,j}$ and concentration $X_{i,j}$ giving the ordered pair ($X_{i,j}I_{i,j}$). If the observed concentration is X_i, the corresponding subindex value I_i is calculated using the following equation over the concentration range:

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$X_{i,j} \le X_i \le X_{i,j+1}$:

$$I_i = \frac{I_{i,j+1} - I_{i,j}}{X_{i,j+1} - X_{i,j}} (X_i - X_{i,j}) + I_{i,j} \qquad (1)$$

for $X_{i,j} \le X_i \le X_{i,j+1}$

where X_i = observed concentration for ith pollutant

$I_{i,j}$ = PSI value for ith pollutant and jth breakpoint (Table 1 or 2)

$I_{i,j+1}$ = PSI value for ith pollutant and (j + 1)th breakpoint (Table 1 or 2)

$X_{i,j}$ = concentration for ith pollutant and jth breakpoint (Table 1 or 2)

$X_{i,j+1}$ = concentration for ith pollutant and (j + 1)th breakpoint (Table 1 or 2)

Finally, the overall index is calculated as the maximum of subindices:

$PSI = \max (I_1, I_2, \ldots, I_i, \ldots I_n)$

where

I_i = subindex for ith pollutant

n = number of pollutants (including pollutant combinations)

7.2 Example Computation

Suppose a TSP 24-hour concentration of 283 $\mu g/m^3$ is observed. The TSP subindex is calculated using equation 1 as follows. In Table 1, the observed concentration of $X_i = 283$ $\mu g/m^3$ lies between 260 and 375 $\mu g/m^3$, therefore this computation is carried out for the second segment (j=2). For this segment, $X_{1,2} = 260$ and $X_{1,3} = 375$, with corresponding subindex values for $I_{1,2} = 100$ and $I_{1,3} = 200$. The computation is as follows:

$$I_T = \frac{I_{1,3} - I_{1,2}}{X_{1,3} - X_{1,2}} (283 - X_{1,2}) + I_1 =$$

$$\frac{200 - 100}{375 - 260} (283 - 260) + 100 = \frac{100}{115} \times 23 + 100 = 120$$

Therefore, the TSP subindex is I=120. If four other pollutant subindices calculated in a similar manner from observations on the same data were: $I_2 = 0$, $I_3 = 0$, $I_4 = 20$, and $I_5 = 30$. Then, the overall index is reported as the maximum of these values:

$PSI = \max (120, 0, 0, 20, 30) = 120$

A typical report might contain the following statement: "Today's air quality index is 120 which is regarded as unhealthful. The responsible pollutant is suspended particulate matter. This report represents conditions prevailing over most of the downtown urban area for the previous 24-hour period ending at noon today." If the index were forecast for the next day, the following additional language might also be used: "The current forecast is for improved air quality tomorrow with the index not expected to exceed 80."

8. Exceptions

In many urban areas, a given air pollutant may exhibit low concentrations repetitively. At the discretion of the reporting agency, pollutants for which PSI values are consistently below 50 for an extended period (for example, a season or year) may be excluded in calculations of the daily index.

Because the index is for the purpose of achieving national uniformity of daily air quality reports, the following variations are not permitted unless approved by the EPA Administrator:

a. Exlusion of pollutants described in section 7 from index calculations except as permitted above.

b. Incorporation of pollutants and/or pollutant combinations into the index not described in section 7.

c. Use of breakpoints other than those given in Table 1 or 2.

d. Use of descriptor words other than those given in section 5.

9. Reporting Agency Recordkeeping

The reporting agency shall keep annual records of the frequency with which reporting index values occur in each of the index descriptor categories. These records must also indicate the pollutant monitors in the SLAMS network being used for purposes of calculating the index for each reporting area. Such records must be made available for inspection at the request of the Administrator.

10. Basis for PSI

The development and evaluation of the PSI index structure have been documented extensively. (2-12) The index was created as a result of a joint EPA/CEQ study (2) which identified problems resulting from the diversity of indices used in the United States and Canada. This report proposed design principles that could be used to develop a nationally uniform index to meet the needs of State and local agencies. The design principles on which PSI is based, along with previous versions of the index, have been presented in various scientific reports, (3, 4) articles in technical journals, (4, 5, 11) and at various scientific meetings and conferences. (7-10) Most recently, the history of the development of PSI along with its scientific rationale, has been summarized in a book. (6) In September 1976, PSI was published in the Federal Register (13) for use by State and local air pollution control agencies on a voluntary basis.

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11. Additional Information

A variety of computational techniques have been developed to assist the user in calculating PSI in an accurate, convenient and rapid manner. (6) The primary techniques available are graphs (linear and logarithmic), nomograms, tables, and computer approaches. An EPA report (14) describes each technique, lists its advantages and disadvantages, includes examples of the methods, and provides nomograms and tables in both gravimetric and volumetric units. The nomograms are considered to be the most efficient way of competing the index and should be of greatest assistance to State and local agencies. Computer approaches for calculating PSI also are available. (15) These approaches lend themselves to applications with programmable hand calculators, minicomputers, or large-scale digital computers. A general computer program, Index Plot, used in an earlier evaluation of PSI, (11) is available from EPA and is fully documented. (15) This computer program is useful for analyzing air quality data by means of PSI over relatively long periods (a month, a season, or a year). It plots the time series of daily index values on the line printer, generates and plots a histogram and cumulative frequencies of PSI values, computes summary data by subindex and descriptor category, computes overall statistics for PSI, and inventories all missing values in the data set. Agencies can use this program to translate all historical data collected at any station into the corresponding PSI values, and, thus, retain for recordkeeping purposes a uniform retrospective record of air quality. (11, 15) Requests for these reports should be addressed to the Environmental Protection Agency, Library, MD-35, Research Triangle Park, N.C. 27711.

Additional information on descriptive language to report with the index is provided in an earlier report (1) and in the air quality criteria documents published for each air pollutant. (16-20) Additional information on meteorological forecasting services from the National Weather Service also is available in the literature. (21, 22)

Additional information on the health effects of each air pollutant used in PSI is available in a brochure entitled, "Measuring Air Quality: The New Pollutant Standards Index," Printing Management Office (PM-215), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460.

12. References

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17. "Air Quality Criteria for Sulfur Oxides," USDHEW, PHS, CPEHS, NAPCA, Washington, D.C., January 1969, No. AP-50.

18. "Air Quality Criteria for Carbon Monoxide," USDHEW, PHS, CPEHS, Washington, D.C., March 1970, No. AP-42.

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20. "Air Quality Criteria for Nitrogen Dioxide," EPA, APCO, Washington, D.C., January 1971, No. AP-84.

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22. *National Weather Service Technical Procedures Bulletin* No. 122: "Air Stagnation Guidance for Facsimile and Teletype (3rd Edition)," October 21, 1974. (supercedes previous TPB's Nos. 52, 58 and 69).

TABLE 1—BREAKPOINTS FOR PSI IN METRIC UNITS [1]

PSI value (ψ)	24-hr. TSP $\mu g/m^3$	24-hr. SO_2 $\mu g/m^3$	TSP x SO_2 $(\mu g/m^3)^2$	8-hr. CO $\mu mg/m^3$	1-hr. O_3 $\mu g/m^3$	1-hr. NO_2 $\mu g/m^3$
50	75	80	(2)	5	118	(2)
100	260	365	(2)	10	235	(2)
200	375	800	65×10^3	17	400	1,130
300	625	1,600	261×10^3	34	800	2,260
400	875	2,100	393×10^3	46	1,000	3,000
500	1,000	2,620	490×10^3	57.5	1,200	3,750

[1] At 25°C and 760 mm Hg.
[2] No index value reported at these concentration levels because there is no short-term NAAQS.

TABLE 2—Breakpoints for PSI

[Parts per million]

PSI value (ψ)	24-hr. SO_2	TSP x SO_2 ($\mu g/m^3$ x ppm)	8-hr. CO	1-hr. O_3	1-hr. NO_2
50	0.03	(1)	4.5	.06	(1)
100	0.14	(1)	9	.12	(1)
200	0.30	24.82	15	0.2	0.6
300	0.60	99.66	30	0.4	1.2
400	0.80	150.1	40	0.5	1.6
500	1.00	187.1	50	0.6	2.0

[1] No index value reported at these concentration levels because there is no short-term NAAQS.

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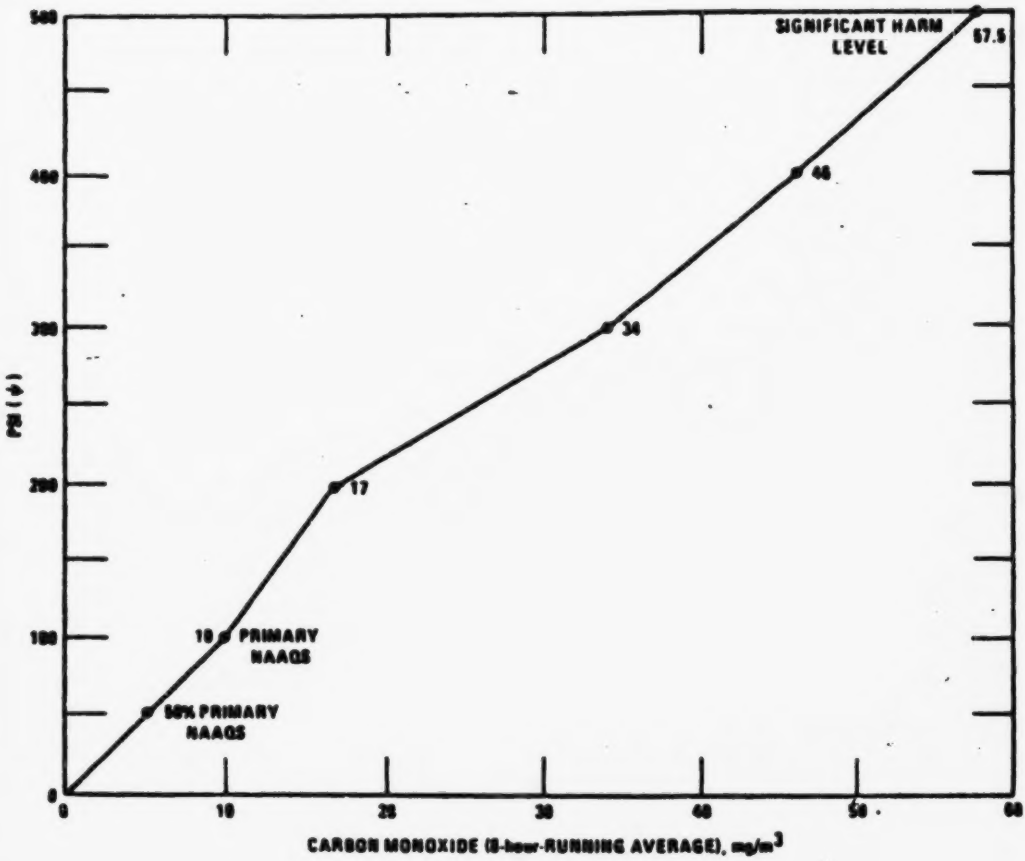

Figure 1. PSI function for carbon monoxide.

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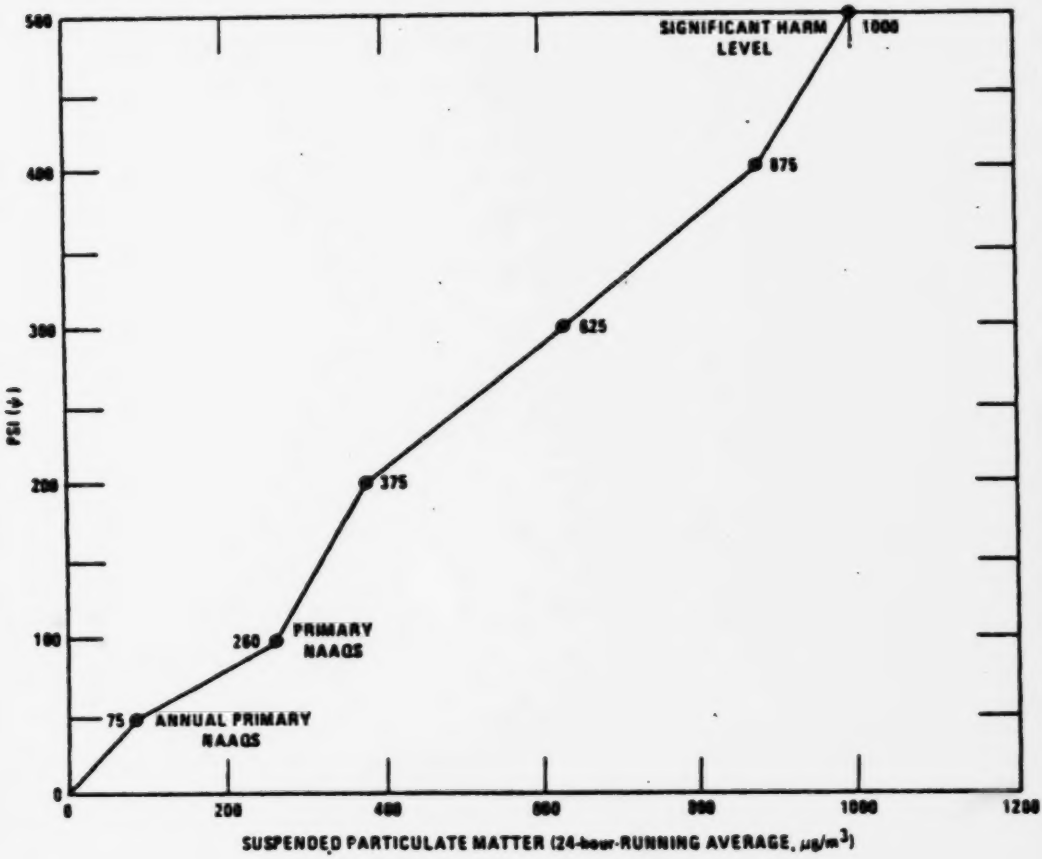

Figure 2. PSI function for suspended particulate matter.

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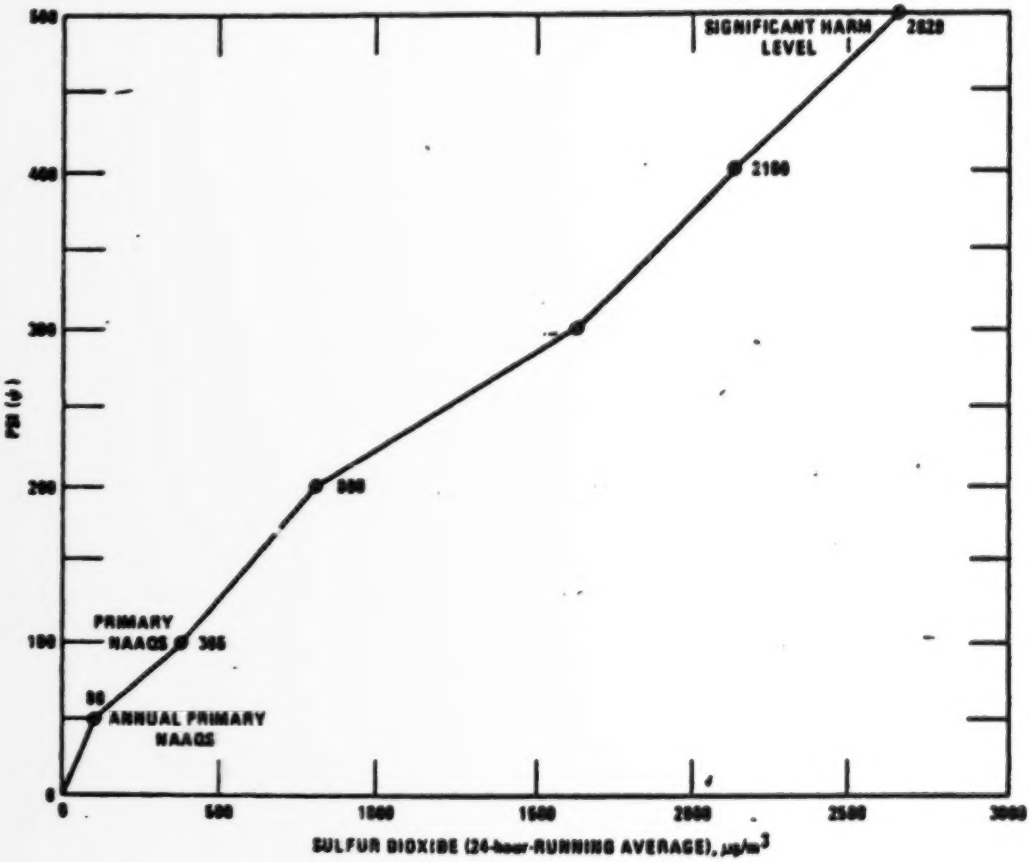

Figure 3. PSI function for sulfur dioxide.

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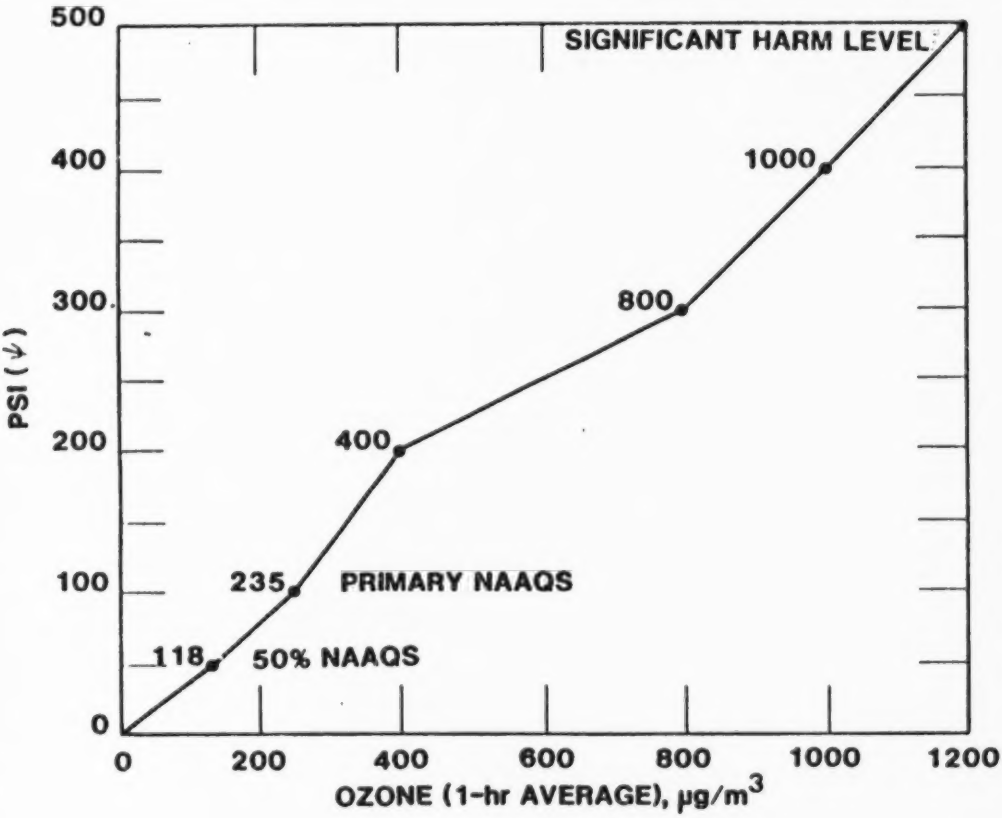

Figure 4. PSI function for ozone.

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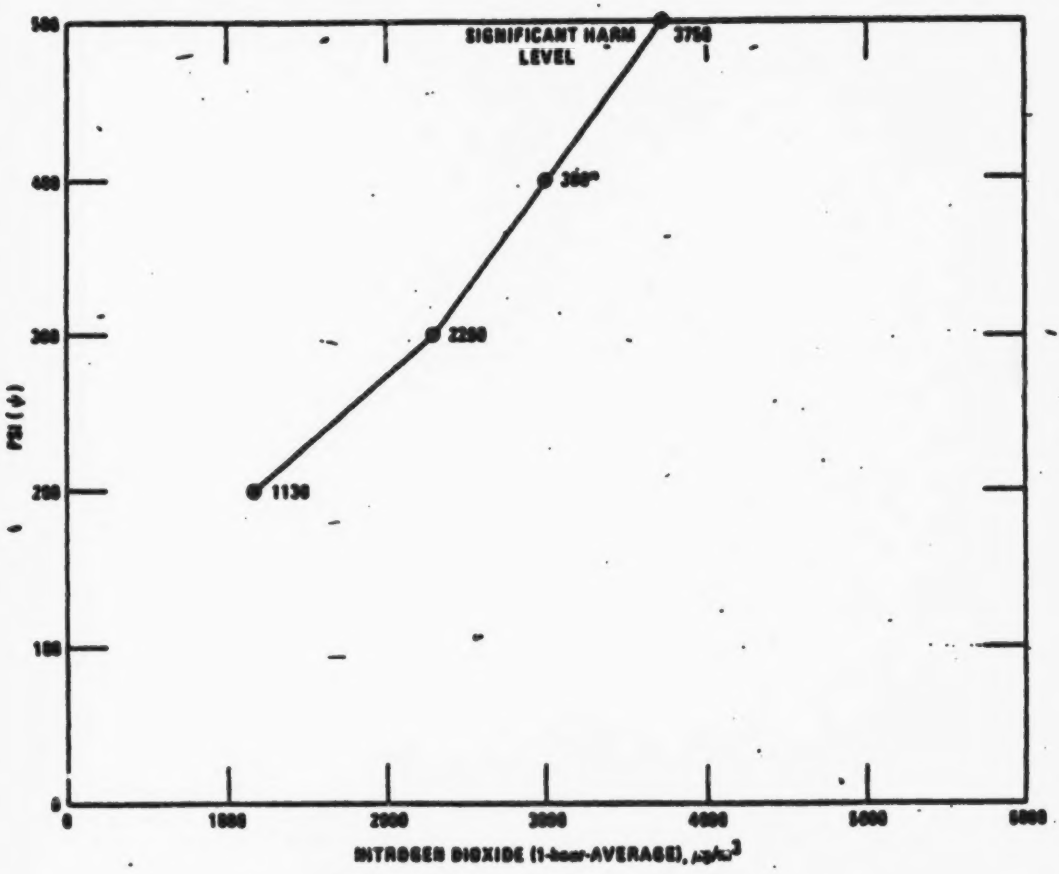

Figure 5. PSI function for nitrogen dioxide.

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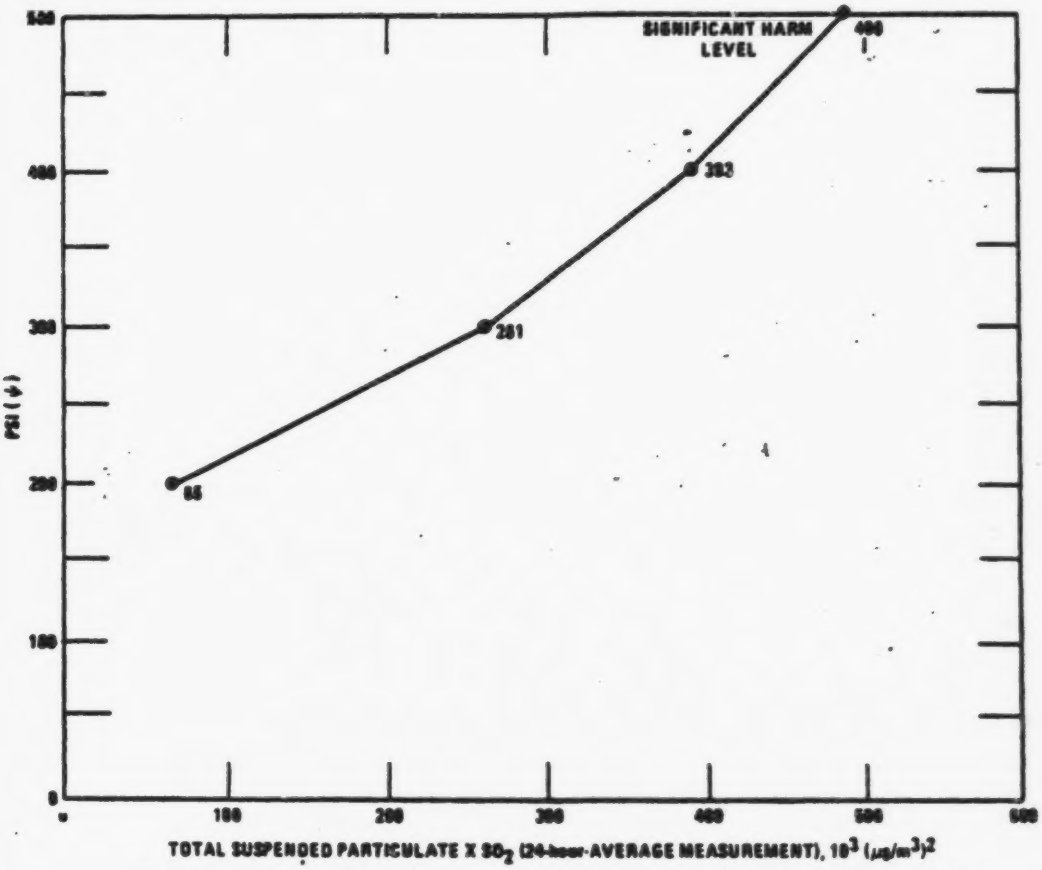

Figure 6. PSI function for product of total suspended particulate and sulfur dioxide.

[44 FR 27571, May 10, 1979; 44 FR 65070, Nov. 9, 1979; 44 FR 72592, Dec. 14, 1979]

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APPENDIX D—REQUIRED EMISSION INVENTORY INFORMATION

AUTHORITY: Sec. 111, 301(a) of the Clean Air Act as amended (42 U.S.C. 7411, 7601(a)), unless otherwise noted.

SOURCE: 36 FR 24877, Dec. 23, 1971, unless otherwise noted.

Subpart A—General Provisions

§ 60.1 Applicability.

Except as provided in Subparts B and C, the provisions of this part apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility.

[40 FR 53346, Nov. 17, 1975]

§ 60.2 Definitions.

The terms used in this part are defined in the Act or in this section as follows:

"Act" means the Clean Air Act (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604, 84 Stat. 1676).

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Affected facility" means, with reference to a stationary source, any apparatus to which a standard is applicable.

"Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Administrator's satisfaction to, in specific cases, produce results adequate for his determination of compliance.

"Capital expenditure" means an expenditure for a physical or operational change to an existing facility which exceeds the product of the applicable "annual asset guideline repair allowance percentage" specified in the latest edition of Internal Revenue Service (IRS) Publication 534 and the existing facility's basis, as defined by section 1012 of the Internal Revenue Code. However, the total expenditure for a physical or operational change to an existing facility must not be reduced by any "excluded additions" as defined in IRS Publication 534, as would be done for tax purposes.

"Commenced" means, with respect to the definition of "new source" in section 111(a)(2) of the Act, that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.

"Construction" means fabrication, erection, or installation of an affected facility.

"Continuous monitoring system" means the total equipment, required under the emission monitoring sections in applicable subparts, used to sample and condition (if applicable), to analyze, and to provide a permanent record of emissions or process parameters.

"Equivalent method" means any method of sampling and analyzing for

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an air pollutant which has been demonstrated to the Administrator's satisfaction to have a consistent and quantitatively known relationship to the reference method, under specified conditions.

"Existing facility" means, with reference to a stationary source, any apparatus of the type for which a standard is promulgated in this part, and the construction or modification of which was commenced before the date of proposal of that standard; or any apparatus which could be altered in such a way as to be of that type.

"Isokinetic sampling" means sampling in which the linear velocity of the gas entering the sampling nozzle is equal to that of the undisturbed gas stream at the sample point.

"Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions.

"Modification" means any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.

"Monitoring device" means the total equipment, required under the monitoring of operations sections in applicable subparts, used to measure and record (if applicable) process parameters.

"Nitrogen oxides" means all oxides of nitrogen except nitrous oxide, as measured by test methods set forth in this part.

"One-hour period" means any 60-minute period commencing on the hour.

"Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

"Owner or operator" means any person who owns, leases, operates, controls, or supervises an affected facility or a stationary source of which an affected facility is a part.

"Particulate matter" means any finely divided solid or liquid material, other than uncombined water, as measured by the reference methods specified under each applicable subpart, or an equivalent or alternative method.

"Proportional sampling" means sampling at a rate that produces a constant ration of sampling rate to stack gas flow rate.

"Reference method" means any method of sampling and analyzing for an air pollutant as described in Appendix A to this part.

"Run" means the net period of time during which an emission sample is collected. Unless otherwise specified, a run may be either intermittent or continuous within the limits of good engineering practice.

"Shutdown" means the cessation of operation of an affected facility for any purpose.

"Six-minute period" means any one of the 10 equal parts of a one-hour period.

"Standard" means a standard of performance proposed or promulgated under this part.

"Standard conditions" means a temperature of 293 K (68°F) and a pressure of 101.3 kilopascals (29.92 in Hg).

"Startup" means the setting in operation of an affected facility for any purpose.

"Volatile Organic Compound" means any organic compound which participates in atmospheric photochemical reactions; or which is measured by a reference method, an equivalent method, an alternative method, or which is determined by procedures specified under any subpart.

[44 FR 55173, Sept. 25, 1979, as amended at 45 FR 5617, Jan. 23, 1980; 45 FR 85415, Dec. 24, 1980]

§ 60.3 Units and abbreviations.

Used in this part are abbreviations and symbols of units of measure. These are defined as follows:

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(a) System International (SI) units of measure:

A—ampere
g—gram
Hz—hertz
J—joule
K—degree Kelvin
kg—kilogram
m—meter
m^3—cubic meter
mg—milligram—10^{-3} gram
mm—millimeter—10^{-3} meter
Mg—megagram—10^6 gram
mol—mole
N—newton
ng—nanogram—10^{-9} gram
nm—nanometer—10^{-9} meter
Pa—pascal
s—second
V—volt
W—watt
Ω—ohm
µg—microgram—10^{-6} gram

(b) Other units of measure:

Btu—British thermal unit
°C—degree Celsius (centigrade)
cal—calorie
cfm—cubic feet per minute
cu ft—cubic feet
dcf—dry cubic feet
dcm—dry cubic meter
dscf—dry cubic feet at standard conditions
dscm—dry cubic meter at standard conditions
eq—equivalent
°F—degree Fahrenheit
ft—feet
gal—gallon
gr—grain
g-eq—gram equivalent
hr—hour
in—inch
k—1,000
l—liter
lpm—liter per minute
lb—pound
meq—milliequivalent
min—minute
ml—milliliter
mol. wt.—molecular weight
ppb—parts per billion
ppm—parts per million
psia—pounds per square inch absolute
psig—pounds per square inch gage
°R—degree Rankine
scf—cubic feet at standard conditions
scfh—cubic feet per hour at standard conditions
scm—cubic meter at standard conditions
sec—second
sq ft—square feet
std—at standard conditions

(c) Chemical nomenclature:

CdS—cadmium sulfide
CO—carbon monoxide
CO_2—carbon dioxide
HCl—hydrochloric acid
Hg—mercury
H_2O—water
H_2S—hydrogen sulfide
H_2SO_4—sulfuric acid
N_2—nitrogen
NO—nitric oxide
NO_2—nitrogen dioxide
NO_x—nitrogen oxides
O_2—oxygen
SO_2—sulfur dioxide
SO_3—sulfur trioxide
SO_x—sulfur oxides

(d) Miscellaneous:

A.S.T.M.—American Society for Testing and Materials

(Secs. 111 and 301(a) of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37000, July 19, 1977; 42 FR 38178, July 27, 1977]

§ 60.4 Address.

(a) All requests, reports, applications, submittals, and other communications to the Administrator pursuant to this part shall be submitted in duplicate and addressed to the appropriate Regional Office of the Environmental Protection Agency, to the attention of the Director, Enforcement Division. The regional offices are as follows:

Region I (Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, Vermont), John F. Kennedy Federal Building, Boston, Massachusetts 02203.

Region II (New York, New Jersey, Puerto Rico, Virgin Islands), Federal Office Building, 26 Federal Plaza (Foley Square), New York, New York 10007.

Region III (Delaware, District of Columbia, Pennsylvania, Maryland, Virginia, West Virginia), Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

Region IV (Alabama, Florida, Georgia, Mississippi, Kentucky, North Carolina, South Carolina, Tennessee), Suite 300, 1421 Peachtree Street, Atlanta, Georgia 30309.

Region V (Illinois, Indiana, Minnesota, Michigan, Ohio, Wisconsin), 230 South Dearborn Street, Chicago, Illinois 60604.

Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, Texas), 1600 Patterson Street, Dallas, Texas 75201.

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Region VII (Iowa, Kansas, Missouri, Nebraska), 324 East 11th Street, Kansas City, Missouri 64106.

Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming), 196 Lincoln Towers, 1860 Lincoln Street, Denver, Colorado 80203.

Region IX (Arizona, California, Hawaii, Nevada, Guam, American Samoa), 100 California Street, San Francisco, California 94111.

Region X (Washington, Oregon, Idaho, Alaska), 1200 Sixth Avenue, Seattle, Washington 98101.

(b) Section 111(c) directs the Administrator to delegate to each State, when appropriate, the authority to implement and enforce standards of performance for new stationary sources located in such State. All information required to be submitted to EPA under paragraph (a) of this section, must also be submitted to the appropriate State Agency of any State to which this authority has been delegated (provided, that each specific delegation may except sources from a certain Federal or State reporting requirement). The appropriate mailing address for those States whose delegation request has been approved is as follows:

(A) [Reserved]

(B) State of Alabama, Air Pollution Control Division, Air Pollution Control Commission, 645 S. McDonough Street, Montgomery, Alabama 36104.

(C) [Reserved]

(D) Arizona:

Maricopa County Department of Health Services, Bureau of Air Pollution Control, 1825 East Roosevelt Street, Phoenix, AZ 85006.

Pima County Health Department, Air Quality Control District, 151 West Congress, Tucson, AZ 85701.

Pima County Air Pollution Control District, 151 West Congress Street, Tucson, AZ 85701.

(E) State of Arkansas, Program Administrator, Air and Hazardous Materials Division, Arkansas Department of Pollution Control and Ecology, 8001 National Drive, Little Rock, Arkansas 72209.

(F) California:

Amador County Air Pollution Control District, P.O. Box 430, 810 Court Street, Jackson, CA 95642

Bay Area Air Pollution Control District, 939 Ellis Street, San Francisco, CA 94109.

Butte County Air Pollution Control District, P.O. Box 1229, 316 Nelson Avenue, Oroville, CA 95965

Calaveras County Air Pollution Control District, Government Center, El Dorado Road, San Andreas, CA 95249

Colusa County Air Pollution Control District, 751 Fremont Street, Colusa, CA 95952

Del Norte County Air Pollution Control District, 909 Highway 101 North, Crescent City, CA 95531

El Dorado Air Pollution Control District, 330 Fair Lane, Placerville, CA 95667

Fresno County Air Pollution Control District, P.O. Box 11867, 1246 L Street, Fresno, CA 93721

Glenn County Air Pollution Control District, P.O. Box 351, 720 North Colusa Street, Willows, CA 95988

Great Basin Unified Air Pollution Control District, 863 North Main Street, Suite 213, Bishop, CA 93514

Humboldt County Air Pollution Control District, 5600 S. Broadway, Eureka, CA 95501.

Imperial County Air Pollution Control District, County Services Building, 939 West Main Street, El Centro, CA 92243

Kern County Air Pollution Control District, 1700 Flower Street (P.O. Box 997), Bakersfield, CA 93302.

Kings County Air Pollution Control District, 330 Campus Drive, Hanford, CA 93230

Lake County Air Pollution Control District, 255 North Forbes Street, Lakeport, CA 95453

Lassen County Air Pollution Control District, 175 Russell Avenue, Susanville, CA 96130

Madera County Air Pollution Control District, 135 W. Yosemite Avenue, Madera, CA 93637.

Mariposa County Air Pollution Control District, Box 5, Mariposa, CA 95338

Mendocino County Air Pollution Control District, County Courthouse, Ukiah, CA 95482.

Merced County Air Pollution Control District, P.O. Box 471, 240 East 15th Street, Merced, CA 95340

Modoc County Air Pollution Control District, 202 West 4th Street, Alturas, CA 96101

Monterey Bay Unified Air Pollution Control District, 1270 Natividad Road, Room 105, Salinas, CA 93906

Nevada County Air Pollution Control District, H.E.W. Complex, Nevada City, CA 95959

Northern Sonoma County Air Pollution Control District, 134 "A" Avenue, Auburn, CA 95448

Placer County Air Pollution Control District, 11491 "B" Avenue, Auburn, CA 95603

Plumas County Air Pollution Control District, P.O. Box 480, Quincy, CA 95971

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Sacramento County Air Pollution Control District, 3701 Branch Center Road, Sacramento, CA 95827.
San Bernardino County Air Pollution Control District, 15579-8th, Victorville, CA 92392
San Diego County Air Pollution Control District, 9150 Chesapeake Drive, San Diego, CA 92123.
San Joaquin County Air Pollution Control District, 1601 E. Hazelton Street (P.O. Box 2009) Stockton, CA 95201.
San Luis Obispo County Air Pollution Control District, P.O. Box 637, San Luis Obispo, CA 93406
Santa Barbara County Air Pollution Control District, 300 North San Antonio Road, Santa Barbara, CA 93110
Shasta County Air Pollution Control District, 2650 Hospital Lane, Redding, CA 96001
Sierra County Air Pollution Control District, P.O. Box 286, Downieville, CA 95936
Siskiyou County Air Pollution Control District, 525 South Foothill Drive, Yreka, CA 96097
South Coast Air Quality Management District, 9150 Flair Drive, El Monte, CA 91731
Stanislaus County Air Pollution Control District, 1030 Scenic Drive, Modesto, CA 95350
Sutter County Air Pollution Control District, Sutter County Office Building, 142 Garden Highway, Yuba City, CA 95991
Tehama County Air Pollution Control District, P.O. Box 38, 1760 Walnut Street, Red Bluff, CA 96080
Tulare County Air Pollution Control District, County Civic Center, Visalia, CA 93277
Tuolumne County Air Pollution Control District, 9 North Washington Street, Sonora, CA 95370
Trinity County Air Pollution Control District, P.O. Box AK, Weaverville, CA 96093
Ventura County Air Pollution Control District, 800 South Victoria Avenue, Ventura, CA 93009
Yolo-Solano Air Pollution Control District, P.O. Box 1006, 323 First Street, #5, Woodland, CA 95695

(1) This notice lists in tabular form, only Air Pollution Control Districts that are affected by this notice. The table lists each pollutant category by its subpart letter and pollutant source name. A star (*) or cross (†) is used to indicate the specific pollutant category that an Air Pollution Control District has been delegated authority over and the date of that delegation. Delegations effective as of August 30, 1979 are indicated by a star (*) and delegations effective as of November 19, 1976 are indicated by a cross (†).

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POLLUTION CONTROL DISTRICT	NEW SOURCE PERFORMANCE STANDARDS (NSPS)																				
	Fossil Fuel Fired Steam Generators Constructed After 8/17/71	Electric Utility Steam Generating Units Constructed After 9/18/78	Incinerators	Portland Cement Plants	Nitric Acid Plants	Sulfuric Acid Plants	Asphalt Concrete Plants	Petroleum Refineries	Storage Vessals For Petroleum Liquids Constructed After 6/11/73 Prior To 5/17/78	Storage Vessals For Petroleum Liquids Constructed After 5/18/78	Secondary Lead Smelters	Secondary Brass And Bronze Ingot Production	Iron And Steel Plants	Sewage Treatment Plants	Primary Copper Smelters	Primary Zinc Smelters	Primary Lead Smelters	Primary Aluminum Reduction Plants	Phosphate Fertilizer Industry: Wet Process Phosphoric Acid Plants	Phosphate Fertilizer Industry: Super Phosphoric Acid Plants	Phosphate Fertilizer Industry: Diammonium Phosphate Plant
POLLUTANT CATEGORY	D	Da	E	F	G	H	I	J	K	Ka	L	M	N	O	P	Q	R	S	T	U	V
DEL NORTE								*							*	*	*				
FRESNO															*	*	*	*	*	*	*
GREAT BASIN	*		*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
HUMBOLDT								*							*	*	*	*			
KERN	*																				
KINGS	*		*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
LOS ANGELES	*		*	*	*	*	*	*	*		*	*	*	*							
MENDOCINO															*	*	*	*	*	*	*
MERCED	*		*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
MODOC	*		*	*				*													
MONTEREY BAY															*	*	*	*			
NORTHERN SONOMA																					
SAN BERNARDINO	*		*	*	*	*	*	*	*		*	*	*	*					*	*	*
SAN DIEGO	*														*	*	*	*	*	*	*
SAN JOAQUIN															*	*	*	*	*	*	*
TRINITY															*	*	*	*			
TULARE	*		*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
VENTURA								*											*	*	*
YOLO-SOLANO	+						+		+												

* 8/30/79
\+ 11/19/76

	NEW SOURCE PERFORMANCE STANDARDS (NSPS)										NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)				
POLLUTION CONTROL DISTRICT	Phosphate Fertilizer Industry: Triple Super Phosphate Plant	Phosphate Fertilizer Industry: Granular Triple Super Phosphate Storage Facilities	Coal Preparation Plants	Ferralloy Production Facilities	Steel Plants: Electric Arc Furnaces	Kraft Pulp Mills	Grain Elevators	Stationary Gas Turbines	Lime Manufacturing Plants	Ammonium Sulfate Manufacture	Asbestos	Beryllium	Beryllium Rocket Motor Firing	Mercury	Vinyl Chloride
POLLUTANT CATEGORY	W	X	Y	Z	AA	BB	DD	GG	HH	PP	B	C	D	E	F
DEL NORTE			*	*		*	*		*						*
FRESNO	*	*	*	*	*						*	*	*	*	
GREAT BASIN	*	*	*	*							*	*	*	*	
HUMBOLDT			*	*		*	*		*						*
KERN						*	*		*		*				*
KINGS	*	*	*	*	*						*	*	*	*	
LOS ANGELES	*	*			*		*				*	*	*	*	
MENDOCINO			*	*											*
MERCED	*	*	*	*	*						*	*	*	*	
MODOC											*	*	*	*	
MONTEREY BAY											*	*	*	*	
NORTHERN SONOMA			*	*											
SAN BERNARDINO	*	*			*		*				*	*	*	*	
SAN DIEGO											*				*
SAN JOAQUIN	*	*	*	*	*	*			*		*	*	*	*	*
TRINITY			*	*											*
TULARE	*	*	*	*	*	*			*		*	*	*	*	*
VENTURA	*	*	*	*	*										
YOLO-SOLANO					+						+			+	

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\+ 11/19/76

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(G) State of Colorado, Colorado Air Pollution Control Division, 4210 East 11th Avenue, Denver, Colorado 80220.

(H) State of Connecticut, Department of Environmental Protection, State Office Building, Hartford, Connecticut 06115.

(I) State of Delaware (for fossil fuel-fired steam generators; incinerators; nitric acid plants; asphalt concrete plants; storage vessels for petroleum liquids; sulfuric acid plants; sewage treatment plants; electric utility steam generating units; stationary gas turbines and petroleum refineries).

Delaware Department of Natural Resources and Environmental Control, Tatnall Building, P.O. Box 1401, Dover, Delaware 19901

(J)—(K) [Reserved]

(L) State of Georgia, Environmental Protection Division, Department of Natural Resources, 270 Washington Street, S.W., Atlanta, Georgia 30334.

(M) [Reserved]

(N) State of Idaho, Department of Health and Welfare, Statehouse, Boise, Idaho 83701.

(O) [Reserved]

(P) State of Indiana, Indiana Air Pollution Control Board, 1330 West Michigan Street, Indianapolis, Indiana 46206.

(Q) State of Iowa, Iowa Department of Environmental Quality, Henry A. Wallace Building, 900 East Grand, Des Moines, Iowa 50316.

(R) [Reserved]

(S) Division of Air Pollution Control, Department for Natural Resources and Environmental Protection, U.S. 127, Frankfort, Ky. 40601.

(T) State of Louisiana, Program Administrator, Air Quality Division, Louisiana Department of Natural Resources, P.O. Box 44066, Baton Rouge, Louisiana 70804.

(U) State of Maine, Department of Environmental Protection, State House, Augusta, Maine 04330.

(V) State of Maryland: Bureau of Air Quality and Noise Control, Maryland State Department of Health and Mental Hygiene, 201 West Preston Street, Baltimore, Maryland 21201.

(W) Massachusetts Department of Environmental Quality Engineering, Division of Air Quality Control, 600 Washington Street, Boston, Massachusetts 02111.

(X) State of Michigan, Air Pollution Control Division, Michigan Department of Natural Resources, Stevens T. Mason Building, 8th Floor, Lansing, Michigan 48926.

(Y) Minnesota Pollution Control Agency, Division of Air Quality, 1935 West County Road B-2, Roseville, Minn. 55113.

(Z) Bureau of Pollution Control, Department of Natural Resources, P.O. Box 10385, Jackson, Mississippi 39209.

(AA) Missouri Department of Natural Resources, Post Office Box 1368, Jefferson City, Missouri 65101.

(BB) State of Montana, Department of Health and Environmental Services, Cogswell Building, Helena, Mont. 59601.

(CC) State of Nebraska, Nebraska Department of Environmental Control, P.O. Box 94877, State House Station, Lincoln, Nebraska 68509.

(DD) Nevada:

Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, 201 South Fall Street. Carson City, NV 89710.

Clark County County District Health Department, Air Pollution Control Division, 625 Shadow Lane, Las Vegas, NV 89106.

Washoe County District Health Department, Division of Environmental Protection, 10 Kirman Avenue, Reno, NV 89502.

(EE) New Hampshire Air Pollution Control Agency, Department of Health and Welfare, State Laboratory Building, Hazen Drive, Concord, New Hampshire 03301.

(FF) State of New Jersey: New Jersey Department of Environmental Protection, John Fitch Plaza, P.O. Box 2807, Trenton, New Jersey 08625.

(GG) [Reserved]

(HH) New York: New York State Department of Environmental Conservation, 50 Wolf Road, New York 12233, attention: Division of Air Resources.

(II) North Carolina Environmental Management Commission, Department of Natural and Economic Resources, Division of Environmental Management, P.O. Box 27687, Raleigh, North Carolina 27611. Attention: Air Quality Section.

(JJ) State of North Dakota, State Department of Health, State Capitol, Bismarck, North Dakota 58501.

(KK) Ohio—

Medina, Summit and Portage Counties; Director, Air Pollution Control, 177 South Broadway, Akron, Ohio 44308.

Stark County; Director, Air Pollution Control Division, Canton City Health Department, City Hall, 218 Cleveland Avenue SW., Canton, Ohio 44702.

Butler, Clermont, Hamilton and Warren Counties; Superintendent, Division of Air Pollution Control, 2400 Beekman Street, Cincinnati, Ohio 45214.

Cuyahoga County; Commissioner, Division of Air Pollution Control, Department of Public Health and Welfare, 2735 Broadway Avenue, Cleveland, Ohio 44115.

Lorain County; Control Officer, Division of Air Pollution Control, 200 West Erie Avenue, 7th Floor, Lorain, Ohio 44052.

Belmont, Carroll, Columbiana, Harrison, Jefferson, and Monroe Counties; Director, North Ohio Valley Air Authority

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(NOVAA), 814 Adams Street, Steubenville, Ohio 43952.

Clark, Darke, Greene, Miami, Montgomery, and Preble Counties; Supervisor, Regional Air Pollution Control Agency (RAPCA), Montgomery County Health Department, 451 West Third Street, Dayton, Ohio 45402.

Lucas County and the City of Rossford (in Wood County); Director, Toledo Pollution Control Agency, 26 Main Street, Toledo, Ohio 43605.

Adams, Brown, Lawrence, and Scioto Counties; Engineer-Director, Air Division, Portsmouth City Health Department, 740 Second Street, Portsmouth, Ohio 45662.

Allen, Ashland, Auglaize, Crawford, Defiance, Erie, Fulton, Hancock, Hardin, Henry, Huron, Knox, Marion, Mercer, Morrow, Ottawa, Paulding, Putnam, Richland, Sandusky, Seneca, Van Wert, Williams, Wood (except City of Rossford), and Wyandot Counties; Ohio Environmental Protection Agency, Northwest District Office, 111 West Washington Street, Bowling Green, Ohio 43402.

Ashtabula, Geauga, Lake, Mahoning, Trumbull, and Wayne Counties; Ohio Environmental Protection Agency, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

Athens, Coshocton, Gallia, Guernsey, Highland, Hocking, Holmes, Jackson, Meigs, Morgan, Muskingum, Noble, Perry, Pike, Ross, Tuscarawas, Vinton, and Washington Counties; Ohio Environmental Protection Agency, Southeast District Office, Route 3, Box 603, Logan, Ohio 43138.

Champaign, Clinton, Logan, and Shelby Counties; Ohio Environmental Protection Agency, Southwest District Office, 7 East Fourth Street, Dayton, Ohio 45402.

Delaware, Fairfield, Fayette, Franklin, Licking, Madison, Pickaway, and Union Counties; Ohio Environmental Protection Agency, Central District Office, 369 East Broad Street, Columbus, Ohio 43215.

(LL) State of Oklahoma, Oklahoma State Department of Health, Air Quality Service, P.O. Box 53551, Oklahoma City, Oklahoma 73152.

(MM) State of Oregon, Department of Environmental Quality, 1234 SW. Morrison Street, Portland, Oregon 97205.

(i)—(viii) [Reserved]

(ix) Lane Regional Air Pollution Authority, 1244 Walnut Street, Eugene, Oregon 97403.

(NN) (a) City of Philadelphia: Philadelphia Department of Public Health, Air Management Services, 500 S. Broad Street, Philadelphia, PA 19146.

(b) Commonwealth of Pennsylvania: Department of Environmental Resources, Post Office Box 2063, Harrisburg, Pennsylvania 17120.

(c) Allegheny County: Allegheny County Health Department, Bureau of Air Pollution Control, 301 Thirty-ninth Street, Pittsburgh, Pennsylvania 15201.

(OO) State of Rhode Island, Department of Environmental Management, 83 Park Street, Providence, Rhode Island 02908.

(PP) State of South Carolina, Office of Environmental Quality Control, Department of Health and Environmental Control, 2600 Bull Street, Columbia, South Carolina 29201.

(QQ) State of South Dakota, Department of Environmental Protection, Joe Foss Building, Pierre, South Dakota 57501.

(RR) Division of Air Pollution Control, Tennessee Department of Public Health, 256 Capitol Hill Building, Nashville, Tennessee 37219.

(SS) State of Texas, Texas Air Control Board, 8520 Shoal Creek Boulevard, Austin, Texas 78758

(TT) State of Utah, Utah Air Conservation Committee, State Division of Health, 44 Medical Drive, Salt Lake City, Utah 84113.

(UU) State of Vermont, Agency of Environmental Protection, Box 489, Montpelier, Vermont 05602.

(VV) Commonwealth of Virginia, Virginia State Air Pollution Control Board, Room 1106, Ninth Street Office Building, Richmond, Virginia 23219.

(WW)(i) Washington: State of Washington, Department of Ecology, Olympia, Washington 98504.

(ii) Northwest Air Pollution Authority, 207 Pioneer Building, Second and Pine Streets, Mount Vernon, Washington 98273.

(iii) Puget Sound Air Pollution Control Agency, 410 West Harrison Street, Seattle, Washington 98119.

(iv) Spokane County Air Pollution Control Authority, North 811 Jefferson, Spokane, Washington 99201.

(v) Southwest Air Pollution Control Authority, Suite 7601 H, NE Hazel Dell Avenue, Vancouver, Washington 98665.

(vi) Olympic Air Pollution Control Authority, 120 East State Avenue, Olympia, WA 98501.

(vii) [Reserved]

(viii) Benton-Franklin-Walla Walla Counties Air Pollution Control Authority, 650 George Washington Way, Richland, Washington 99352.

(XX) [Reserved]

(YY) Wisconsin—Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, Wisconsin 53707.

(ZZ) State of Wyoming, Air Quality Division of the Department of Environmental Quality, Hathaway Building, Cheyenne, Wyo. 82002.

(AAA) [Reserved]

(BBB) Commonwealth of Puerto Rico: Commonwealth of Puerto Rico Environ-

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mental Quality Board, P.O. Box 11785, Santurce, P.R. 00910.

(CCC) U.S. Virgin Islands: U.S. Virgin Islands Department of Conservation and Cultural Affairs, P.O. Box 578, Charlotte Amalie, St. Thomas, U.S. Virgin Islands 00801.

(Secs. 101, 110, 111, 112, 114, 160-169, 301, Clean Air Act as amended (42 U.S.C. 7401, 7410, 7411, 7412, 7414, 7470-7479, 7491, 7601) (42 U.S.C. 1857c-7))

[40 FR 18169, Apr. 25, 1975]

NOTE: For Federal Register citations to § 60.4 see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

EFFECTIVE DATE NOTE: At 47 FR 25525, June 14, 1982, paragraph (b) (NN) was revised, effective July 14, 1982. For the convenience of the user, the superseded text appears below.

§ 60.4 Adddress.

* * * * *

(b) * * *

(NN) (a) City of Philadelphia: Philadelphia Department of Public Health, Air Management Services, 801 Arch Street, Philadelphia, Pennsylvania 19107.

(b) Commonwealth of Pennsylvania, Department of Environmental Resources, Post Office Box 2063, Harrisburg, Pennsylvania 17120.

* * * * *

§ 60.5 Determination of construction or modification.

(a) When requested to do so by an owner or operator, the Administrator will make a determination of whether action taken or intended to be taken by such owner or operator constitutes construction (including reconstruction) or modification or the commencement thereof within the meaning of this part.

(b) The Administrator will respond to any request for a determination under paragraph (a) of this section within 30 days of receipt of such request.

[40 FR 58418, Dec. 16, 1975]

§ 60.6 Review of plans.

(a) When requested to do so by an owner or operator, the Administrator will review plans for construction or modification for the purpose of providing technical advice to the owner or operator.

(b)(1) A separate request shall be submitted for each construction or modification project.

(2) Each request shall identify the location of such project, and be accompanied by technical information describing the proposed nature, size, design, and method of operation of each affected facility involved in such project, including information on any equipment to be used for measurement or control of emissions.

(c) Neither a request for plans review nor advice furnished by the Administrator in response to such request shall (1) relieve an owner or operator of legal responsibility for compliance with any provision of this part or of any applicable State or local requirement, or (2) prevent the Administrator from implementing or enforcing any provision of this part or taking any other action authorized by the Act.

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 9314, Mar. 8, 1974]

§ 60.7 Notification and record keeping.

(a) Any owner or operator subject to the provisions of this part shall furnish the Administrator written notification as follows:

(1) A notification of the date construction (or reconstruction as defined under § 60.15) of an affected facility is commenced postmarked no later than 30 days after such date. This requirement shall not apply in the case of mass-produced facilities which are purchased in completed form.

(2) A notification of the anticipated date of initial startup of an affected facility postmarked not more than 60 days nor less than 30 days prior to such date.

(3) A notification of the actual date of initial startup of an affected facility postmarked within 15 days after such date.

(4) A notification of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change is specifically exempted under an applicable subpart or in § 60.14(e). This notice shall be postmarked 60 days or as soon as practicable before the

change is commenced and shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of the facility before and after the change, and the expected completion date of the change. The Administrator may request additional relevant information subsequent to this notice.

(5) A notification of the date upon which demonstration of the continuous monitoring system performance commences in accordance with § 60.13(c). Notification shall be postmarked not less than 30 days prior to such date.

(b) Any owner or operator subject to the provisions of this part shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative.

(c) Each owner or operator required to install a continuous monitoring system shall submit a written report of excess emissions (as defined in applicable subparts) to the Administrator for every calendar quarter. All quarterly reports shall be postmarked by the 30th day following the end of each calendar quarter and shall include the following information:

(1) The magnitude of excess emissions computed in accordance with § 60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emissions.

(2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.

(3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments.

(4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

(d) Any owner or operator subject to the provisions of this part shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this part recorded in a permanent form suitable for inspection. The file shall be retained for at least two years following the date of such measurements, maintenance, reports, and records.

(e) If notification substantially similar to that in paragraph (a) of this section is required by any other State or local agency, sending the Administrator a copy of that notification will satisfy the requirements of paragraph (a) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[36 FR 24877, Dec. 28, 1971, as amended at 40 FR 46254, Oct. 6, 1975; 40 FR 58418, Dec. 16, 1975; 43 FR 8800, Mar. 3, 1978; 45 FR 5617, Jan. 23, 1980]

§ 60.8 Performance tests.

(a) Within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of such facility and at such other times as may be required by the Administrator under section 114 of the Act, the owner or operator of such facility shall conduct performance test(s) and furnish the Administrator a written report of the results of such performance test(s).

(b) Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subpart unless the Administrator (1) specifies or approves, in specific cases, the use of a reference method with minor changes in methodology, (2) approves the use of an equivalent method, (3) approves the use of an alternative method the results of which he has

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determined to be adequate for indicating whether a specific source is in compliance, or (4) waives the requirement for performance tests because the owner or operator of a source has demonstrated by other means to the Administrator's satisfaction that the affected facility is in compliance with the standard. Nothing in this paragraph shall be construed to abrogate the Administrator's authority to require testing under section 114 of the Act.

(c) Performance tests shall be conducted under such conditions as the Administrator shall specify to the plant operator based on representative performance of the affected facility. The owner or operator shall make available to the Administrator such records as may be necessary to determine the conditions of the performance tests. Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions for the purpose of a performance test nor shall emissions in excess of the level of the applicable emission limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emission limit unless otherwise specified in the applicable standard.

(d) The owner or operator of an affected facility shall provide the Administrator at least 30 days prior notice of any performance test, except as specified under other subparts, to afford the Administrator the opportunity to have an observer present.

(e) The owner or operator of an affected facility shall provide, or cause to be provided, performance testing facilities as follows:

(1) Sampling ports adequate for test methods applicable to such facility.

(2) Safe sampling platform(s).

(3) Safe access to sampling platform(s).

(4) Utilities for sampling and testing equipment.

(f) Unless otherwise specified in the applicable subpart, each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard, the arithmetic means of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances, beyond the owner or operator's control, compliance may, upon the Administrator's approval, be determined using the arithmetic mean of the results of the two other runs.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 9314, Mar. 8, 1974; 42 FR 57126, Nov. 1, 1977; 43 FR 8800, Mar. 3, 1978; 44 FR 33612, June 11, 1979]

§ 60.9 Availability of information.

The availability to the public of information provided to, or otherwise obtained by, the Administrator under this part shall be governed by Part 2 of this chapter. (Information submitted voluntarily to the Administrator for the purposes of §§ 60.5 and 60.6 is governed by § 2.201 through § 2.213 of this chapter and not by § 2.301 of this chapter.)

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 36918, Sept. 1, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.10 State authority.

The provisions of this part shall not be construed in any manner to preclude any State or political subdivision thereof from:

(a) Adopting and enforcing any emission standard or limitation applicable to an affected facility, provided that such emission standard or limitation is not less stringent than the standard applicable to such facility.

(b) Requiring the owner or operator of an affected facility to obtain permits, licenses, or approvals prior to initiating construction, modification, or operation of such facility.

(Sec. 116, Clean Air Act as amended (42 U.S.C. 7416))

[36 FR 24877, Dec. 23, 1971, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.11 Compliance with standards and maintenance requirements.

(a) Compliance with standards in this part, other than opacity standards, shall be determined only by performance tests established by § 60.8, unless otherwise specified in the applicable standard.

(b) Compliance with opacity standards in this part shall be determined by conducting observations in accordance with Reference Method 9 in Appendix A of this part or any alternative method that is approved by the Administrator. Opacity readings of portions of plumes which contain condensed, uncombined water vapor shall not be used for purposes of determining compliance with opacity standards. The results of continuous monitoring by transmissometer which indicate that the opacity at the time visual observations were made was not in excess of the standard are probative but not conclusive evidence of the actual opacity of an emission, provided that the source shall meet the burden of proving that the instrument used meets (at the time of the alleged violation) Performance Specification 1 in Appendix B of this part, has been properly maintained and (at the time of the alleged violation) calibrated, and that the resulting data have not been tampered with in any way.

(c) The opacity standards set forth in this part shall apply at all times except during periods of startup, shutdown, malfunction, and as otherwise provided in the applicable standard.

(d) At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

(e)(1) An owner or operator of an affected facility may request the Administrator to determine opacity of emissions from the affected facility during the initial performance tests required by § 60.8.

(2) Upon receipt from such owner or operator of the written report of the results of the performance tests required by § 60.8, the Administrator will make a finding concerning compliance with opacity and other applicable standards. If the Administrator finds that an affected facility is in compliance with all applicable standards for which performance tests are conducted in accordance with § 60.8 of this part but during the time such performance tests are being conducted fails to meet any applicable opacity standard, he shall notify the owner or operator and advise him that he may petition the Administrator within 10 days of receipt of notification to make appropriate adjustment to the opacity standard for the affected facility.

(3) The Administrator will grant such a petition upon a demonstration by the owner or operator that the affected facility and associated air pollution control equipment was operated and maintained in a manner to minimize the opacity of emissions during the performance tests; that the performance tests were performed under the conditions established by the Administrator; and that the affected facility and associated air pollution control equipment were incapable of being adjusted or operated to meet the applicable opacity standard.

(4) The Administrator will establish an opacity standard for the affected facility meeting the above requirements at a level at which the source will be able, as indicated by the performance and opacity tests, to meet the opacity standard at all times during which the source is meeting the mass or concentration emission standard. The Administrator will promulgate the new opacity standard in the FEDERAL REGISTER.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 28565, Oct. 15, 1973, as amended at 39 FR 39873, Nov. 12, 1974; 42 FR 26206,

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May 23, 1977; 43 FR 8800, Mar. 3, 1978; 45 FR 23379, Apr. 4, 1980]

§ 60.12 Circumvention.

No owner or operator subject to the provisions of this part shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere.

[39 FR 9314, Mar. 8, 1974]

§ 60.13 Monitoring requirements.

(a) For the purposes of this section, all continuous monitoring systems required under applicable subparts shall be subject to the provisions of this section upon promulgation of performance specifications for continuous monitoring system under Appendix B to this part, unless:

(1) The continuous monitoring system is subject to the provisions of paragraphs (c)(2) and (c)(3) of this section, or

(2) otherwise specified in an applicable subpart or by the Administrator.

(b) All continuous monitoring systems and monitoring devices shall be installed and operational prior to conducting performance tests under § 60.8. Verification of operational status shall, as a minimum, consist of the following:

(1) For continuous monitoring systems referenced in paragraph (c)(1) of this section, completion of the conditioning period specified by applicable requirements in Appendix B.

(2) For continuous monitoring systems referenced in paragraph (c)(2) of this section, completion of seven days of operation.

(3) For monitoring devices referenced in applicable subparts, completion of the manufacturer's written requirements or recommendations for checking the operation or calibration of the device.

(c) During any performance tests required under § 60.8 or within 30 days thereafter and at such other times as may be required by the Administrator under section 114 of the Act, the owner or operator of any affected facility shall conduct continuous monitoring system performance evaluations and furnish the Administrator within 60 days thereof two or, upon request, more copies of a written report of the results of such tests. These continuous monitoring system performance evaluations shall be conducted in accordance with the following specifications and procedures:

(1) Continuous monitoring systems listed within this paragraph except as provided in paragraph (c)(2) of this section shall be evaluated in accordance with the requirements and procedures contained in the applicable performance specification of Appendix B as follows:

(i) Continuous monitoring systems for measuring opacity of emissions shall comply with Performance Specification 1.

(ii) Continuous monitoring systems for measuring nitrogen oxides emissions shall comply with Performance Specification 2.

(iii) Continuous monitoring systems for measuring sulfur dioxide emissions shall comply with Performance Specification 2.

(iv) Continuous monitoring systems for measuring the oxygen content or carbon dioxide content of effluent gases shall comply with Performance Specification 3.

(2) An owner or operator who, prior to September 11, 1974, entered into a binding contractual obligation to purchase specific continuous monitoring system components except as referenced by paragraph (c)(2)(iii) of this section shall comply with the following requirements:

(i) Continuous monitoring systems for measuring opacity of emissions shall be capable of measuring emission levels within ±20 percent with a confidence level of 95 percent. The Calibration Error Test and associated calculation procedures set forth in Performance Specification 1 of Appendix B shall be used for demonstrating compliance with this specification.

(ii) Continuous monitoring systems for measurement of nitrogen oxides or

sulfur dioxide shall be capable of measuring emission levels within ±20 percent with a confidence level of 95 percent. The Calibration Error Test, the Field Test for Accuracy (Relative), and associated operating and calculation procedures set forth in Performance Specification 2 of Appendix B shall be used for demonstrating compliance with this specification.

(iii) Owners or operators of all continuous monitoring systems installed on an affected facility prior to October 6, 1975 are not required to conduct tests under paragraphs (c)(2)(i) and/or (ii) of this section unless requested by the Administrator.

(3) All continuous monitoring systems referenced by paragraph (c)(2) of this section shall be upgraded or replaced (if necessary) with new continuous monitoring systems, and the new or improved systems shall be demonstrated to comply with applicable performance specifications under paragraph (c)(1) of this section on or before September 11, 1979.

(d) Owners or operators of all continuous monitoring systems installed in accordance with the provisions of this part shall check the zero and span drift at least once daily in accordance with the method prescribed by the manufacturer of such systems unless the manufacturer recommends adjustments at shorter intervals, in which case such recommendations shall be followed. The zero and span shall, as a minimum, be adjusted whenever the 24-hour zero drift or 24-hour calibration drift limits of the applicable performance specifications in Appendix B are exceeded. For continuous monitoring systems measuring opacity of emissions, the optical surfaces exposed to the effluent gases shall be cleaned prior to performing the zero or span drift adjustments except that for systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds four percent opacity. Unless otherwise approved by the Administrator, the following procedures, as applicable, shall be followed:

(1) For extractive continuous monitoring systems measuring gases, minimum procedures shall include introducing applicable zero and span gas mixtures into the measurement system as near the probe as is practical. Span and zero gases certified by their manufacturer to be traceable to National Bureau of Standards reference gases shall be used whenever these reference gases are available. The span and zero gas mixtures shall be the same composition as specified in Appendix B of this part. Every six months from date of manufacture, span and zero gases shall be reanalyzed by conducting triplicate analyses with Reference Methods 6 for SO_2, 7 for NO_x, and 3 for O_2 and CO_2, respectively. The gases may be analyzed at less frequent intervals if longer shelf lives are guaranteed by the manufacturer.

(2) For non-extractive continuous monitoring systems measuring gases, minimum procedures shall include upscale check(s) using a certified calibration gas cell or test cell which is functionally equivalent to a known gas concentration. The zero check may be performed by computing the zero value from upscale measurements or by mechanically producing a zero condition.

(3) For continuous monitoring systems measuring opacity of emissions, minimum procedures shall include a method for producing a simulated zero opacity condition and an upscale (span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of the light beam. Such procedures shall provide a system check of the analyzer internal optical surfaces and all electronic circuitry including the lamp and photodetector assembly.

(e) Except for system breakdowns, repairs, calibration checks, and zero and span adjustments required under paragraph (d) of this section, all continuous monitoring systems shall be in continuous operation and shall meet minimum frequency of operation requirements as follows:

(1) All continuous monitoring systems referenced by paragraphs (c)(1) and (c)(2) of this section for measuring opacity of emissions shall complete a minimum of one cycle of sampling and analyzing for each successive ten-

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second period and one cycle of data recording for each successive six-minute period.

(2) All continuous monitoring systems referenced by paragraph (c)(1) of this section for measuring oxides of nitrogen, sulfur dioxide, carbon dioxide, or oxygen shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

(3) All continuous monitoring systems referenced by paragraph (c)(2) of this section, except opacity, shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive one-hour period.

(f) All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions or process parameters from the affected facility are obtained. Additional procedures for location of continuous monitoring systems contained in the applicable Performance Specifications of Appendix B of this part shall be used.

(g) When the effluents from a single affected facility or two or more affected facilities subject to the same emission standards are combined before being released to the atmosphere, the owner or operator may install applicable continuous monitoring systems on each effluent or on the combined effluent. When the affected facilities are not subject to the same emission standards, separate continuous monitoring systems shall be installed on each effluent. When the effluent from one affected facility is released to the atmosphere through more than one point, the owner or operator shall install applicable continuous monitoring systems on each separate effluent unless the installation of fewer systems is approved by the Administrator.

(h) Owners or operators of all continuous monitoring systems for measurement of opacity shall reduce all data to six-minute averages and for systems other than opacity to one-hour averages for time periods under § 60.2 (x) and (r) respectively. Six-minute opacity averages shall be calculated from 24 or more data points equally spaced over each six-minute period. For systems other than opacity, one-hour averages shall be computed from four or more data points equally spaced over each one-hour period. Data recorded during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages computed under this paragraph. An arithmetic or integrated average of all data may be used. The data output of all continuous monitoring systems may be recorded in reduced or nonreduced form (e.g. ppm pollutant and percent O_2 or lb/million Btu of pollutant). All excess emissions shall be converted into units of the standard using the applicable conversion procedures specified in subparts. After conversion into units of the standard, the data may be rounded to the same number of significant digits used in subparts to specify the applicable standard (e.g., rounded to the nearest one percent opacity).

(i) After receipt and consideration of written application, the Administrator may approve alternatives to any monitoring procedures or requirements of this part including, but not limited to the following:

(1) Alternative monitoring requirements when installation of a continuous monitoring system or monitoring device specified by this part would not provide accurate measurements due to liquid water or other interferences caused by substances with the effluent gases.

(2) Alternative monitoring requirements when the affected facility is infrequently operated.

(3) Alternative monitoring requirements to accommodate continuous monitoring systems that require additional measurements to correct for stack moisture conditions.

(4) Alternative locations for installing continuous monitoring systems or monitoring devices when the owner or operator can demonstrate that installation at alternate locations will enable accurate and representative measurements.

(5) Alternative methods of converting pollutant concentration measurements to units of the standards.

(6) Alternative procedures for performing daily checks of zero and span

drift that do not involve use of span gases or test cells.

(7) Alternatives to the A.S.T.M. test methods or sampling procedures specified by any subpart.

(8) Alternative continuous monitoring systems that do not meet the design or performance requirements in Performance Specification 1, Appendix B, but adequately demonstrate a definite and consistent relationship between its measurements and the measurements of opacity by a system complying with the requirements in Performance Specification 1. The Administrator may require that such demonstration be performed for each affected facility.

(9) Alternative monitoring requirements when the effluent from a single affected facility or the combined effluent from two or more affected facilities are released to the atmosphere through more than one point.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 46255, Oct. 6, 1975; 40 FR 59205, Dec. 22, 1975, as amended at 41 FR 35185, Aug. 20, 1976; 42 FR 5936, Jan. 31, 1977; 43 FR 7572, Feb. 23, 1978; 43 FR 8800, Mar. 3, 1978]

§ 60.14 Modification.

(a) Except as provided under paragraphs (e) and (f) of this section, any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere.

(b) Emission rate shall be expressed as kg/hr of any pollutant discharged into the atmosphere for which a standard is applicable. The Administrator shall use the following to determine emission rate:

(1) Emission factors as specified in the latest issue of "Compilation of Air Pollutant Emission Factors," EPA Publication No. AP-42, or other emission factors determined by the Administrator to be superior to AP-42 emission factors, in cases where utilization of emission factors demonstrate that the emission level resulting from the physical or operational change will either clearly increase or clearly not increase.

(2) Material balances, continuous monitor data, or manual emission tests in cases where utilization of emission factors as referenced in paragraph (b)(1) of this section does not demonstrate to the Administrator's satisfaction whether the emission level resulting from the physical or operational change will either clearly increase or clearly not increase, or where an owner or operator demonstrates to the Administrator's satisfaction that there are reasonable grounds to dispute the result obtained by the Administrator utilizing emission factors as referenced in paragraph (b)(1) of this section. When the emission rate is based on results from manual emission tests or continuous monitoring systems, the procedures specified in Appendix C of this part shall be used to determine whether an increase in emission rate has occurred. Tests shall be conducted under such conditions as the Administrator shall specify to the owner or operator based on representative performance of the facility. At least three valid test runs must be conducted before and at least three after the physical or operational change. All operating parameters which may affect emissions must be held constant to the maximum feasible degree for all test runs.

(c) The addition of an affected facility to a stationary source as an expansion to that source or as a replacement for an existing facility shall not by itself bring within the applicability of this part any other facility within that source.

(d) [Reserved]

(e) The following shall not, by themselves, be considered modifications under this part:

(1) Maintenance, repair, and replacement which the Administrator determines to be routine for a source category, subject to the provisions of paragraph (c) of this section and § 60.15.

(2) An increase in production rate of an existing facility, if that increase

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can be accomplished without a capital expenditure on that facility.

(3) An increase in the hours of operation.

(4) Use of an alternative fuel or raw material if, prior to the date any standard under this part becomes applicable to that source type, as provided by § 60.1, the existing facility was designed to accommodate that alternative use. A facility shall be considered to be designed to accommodate an alternative fuel or raw material if that use could be accomplished under the facility's construction specifications as amended prior to the change. Conversion to coal required for energy considerations, as specified in section 111(a)(8) of the Act, shall not be considered a modification.

(5) The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or is replaced by a system which the Administrator determines to be less environmentally beneficial.

(6) The relocation or change in ownership of an existing facility.

(f) Special provisions set forth under an applicable subpart of this part shall supersede any conflicting provisions of this section.

(g) Within 180 days of the completion of any physical or operational change subject to the control measures specified in paragraph (a) of this section, compliance with all applicable standards must be achieved.

[40 FR 58419, Dec. 16, 1975, amended at 43 FR 34347, Aug. 3, 1978; 45 FR 5617, Jan. 23, 1980]

§ 60.15 Reconstruction.

(a) An existing facility, upon reconstruction, becomes an affected facility, irrespective of any change in emission rate.

(b) "Reconstruction" means the replacement of components of an existing facility to such an extent that:

(1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and

(2) It is technologically and economically feasible to meet the applicable standards set forth in this part.

(c) "Fixed capital cost" means the capital needed to provide all the depreciable components.

(d) If an owner or operator of an existing facility proposes to replace components, and the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, he shall notify the Administrator of the proposed replacements. The notice must be postmarked 60 days (or as soon as practicable) before construction of the replacements is commenced and must include the following information:

(1) Name and address of the owner or operator.

(2) The location of the existing facility.

(3) A brief description of the existing facility and the components which are to be replaced.

(4) A description of the existing air pollution control equipment and the proposed air pollution control equipment.

(5) An estimate of the fixed capital cost of the replacements and of constructing a comparable entirely new facility.

(6) The estimated life of the existing facility after the replacements.

(7) A discussion of any economic or technical limitations the facility may have in complying with the applicable standards of performance after the proposed replacements.

(e) The Administrator will determine, within 30 days of the receipt of the notice required by paragraph (d) of this section and any additional information he may reasonably require, whether the proposed replacement constitutes reconstruction.

(f) The Administrator's determination under paragraph (e) shall be based on:

(1) The fixed capital cost of the replacements in comparison to the fixed capital cost that would be required to construct a comparable entirely new facility;

(2) The estimated life of the facility after the replacements compared to

the life of a comparable entirely new facility;

(3) The extent to which the components being replaced cause or contribute to the emissions from the facility; and

(4) Any economic or technical limitations on compliance with applicable standards of performance which are inherent in the proposed replacements.

(g) Individual subparts of this part may include specific provisions which refine and delimit the concept of reconstruction set forth in this section.

[40 FR 58420, Dec. 16, 1975]

§ 60.16 Priority list.

PRIORITIZED MAJOR SOURCE CATEGORIES

Priority Number[1]	*Source Category*
1.	Synthetic Organic Chemical Manufacturing
	(a) Unit processes
	(b) Storage and handling equipment
	(c) Fugitive emissions sources
	(d) Secondary sources
2.	Industrial Surface Coating: Cans
3.	Petroleum Refineries: Fugitive Sources
4.	Industrial Surface Coating: Paper
5.	Dry Cleaning
	(a) Perchloroethylene
	(b) Petroleum solvent
6.	Graphic Arts
7.	Polymers and Resins: Acrylic Resins
8.	Mineral Wool (Deleted)
9.	Stationary Internal Combustion Engines
10.	Industrial Surface Coating: Fabric
11.	Fossil-Fuel-Fired Steam Generators: Industrial Boilers
12.	Incineration: Non-Municipal (Deleted)
13.	Non-Metallic Mineral Processing
14.	Metallic Mineral Processing
15.	Secondary Copper (Deleted)
16.	Phosphate Rock Preparation
17.	Foundries: Steel and Gray Iron
18.	Polymers and Resins: Polyethylene
19.	Charcoal Production
20.	Synthetic Rubber
	(a) Tire manufacture
	(b) SBR production
21.	Vegetable Oil
22.	Industrial Surface Coating: Metal Coil
23.	Petroleum Transportation and Marketing
24.	By-Product Coke Ovens
25.	Synthetic Fibers
26.	Plywood Manufacture
27.	Industrial Surface Coating: Automobiles
28.	Industrial Surface Coating: Large Appliances
29.	Crude Oil and Natural Gas Production
30.	Secondary Aluminum
31.	Potash (Deleted)
32.	Lightweight Aggregate Industry: Clay, Shale, and Slate [2]
33.	Glass
34.	Gypsum
35.	Sodium Carbonate
36.	Secondary Zinc (Deleted)
37.	Polymers and Resins: Phenolic
38.	Polymers and Resins: Urea-Melamine
39.	Ammonia (Deleted)
40.	Polymers and Resins: Polystyrene
41.	Polymers and Resins: ABS-SAN Resins
42.	Fiberglass
43.	Polymers and Resins: Polypropylene
44.	Textile Processing
45.	Asphalt Roofing Plants
46.	Brick and Related Clay Products
47.	Ceramic Clay Manufacturing (Deleted)
48.	Ammonium Nitrate Fertilizer
49.	Castable Refractories (Deleted)
50.	Borax and Boric Acid (Deleted)
51.	Polymers and Resins: Polyester Resins
52.	Ammonium Sulfate
53.	Starch
54.	Perlite
55.	Phosphoric Acid: Thermal Process (Deleted)
56.	Uranium Refining
57.	Animal Feed Defluorination (Deleted)
58.	Urea (for fertilizer and polymers)
59.	Detergent (Deleted)

Other Source Categories

Lead acid battery manufacture [3]
Organic solvent cleaning [3]
Industrial surface coating: metal furniture [3]
Stationary gas turbines [4]

[47 FR 951, Jan. 8, 1982]

[1] Low numbers have highest priority, e.g., No. 1 is high priority, No. 59 is low priority.

[2] Formerly titled "Sintering: Clay and Fly Ash".

[3] Minor source category, but included on list since an NSPS is being developed for that source category.

[4] Not prioritized, since an NSPS for this major source category has already been proumlgated.

Subpart B—Adoption and Submittal of State Plans for Designated Facilities

SOURCE: 40 FR 53346, Nov. 17, 1975, unless otherwise noted.

§ 60.20 Applicability.

The provisions of this subpart apply to States upon publication of a final guideline document under § 60.22(a).

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§ 60.21 Definitions.

Terms used but not defined in this subpart shall have the meaning given them in the Act and in Subpart A:

(a) "Designated pollutant" means any air pollutant, emissions of which are subject to a standard of performance for new stationary sources but for which air quality criteria have not been issued, and which is not included on a list published under section 108(a) or section 112(b)(1)(A) of the Act.

(b) "Designated facility" means any existing facility (see § 60.2(aa)) which emits a designated pollutant and which would be subject to a standard of performance for that pollutant if the existing facility were an affected facility (see § 60.2(e)).

(c) "Plan" means a plan under section 111(d) of the Act which establishes emission standards for designated pollutants from designated facilities and provides for the implementation and enforcement of such emission standards.

(d) "Applicable plan" means the plan, or most recent revision thereof, which has been approved under § 60.27(b) or promulgated under § 60.27(d).

(e) "Emission guideline" means a guideline set forth in Subpart C of this part, or in a final guideline document published under § 60.22(a), which reflects the degree of emission reduction achievable through the application of the best system of emission reduction which (taking into account the cost of such reduction) the Administrator has determined has been adequately demonstrated for designated facilities.

(f) "Emission standard" means a legally enforceable regulation setting forth an allowable rate of emissions into the atmosphere, or prescribing equipment specifications for control of air pollution emissions.

(g) "Compliance schedule" means a legally enforceable schedule specifying a date or dates by which a source or category of sources must comply with specific emission standards contained in a plan or with any increments of progress to achieve such compliance.

(h) "Increments of progress" means steps to achieve compliance which must be taken by an owner or operator of a designated facility, including:

(1) Submittal of a final control plan for the designated facility to the appropriate air pollution control agency;

(2) Awarding of contracts for emission control systems or for process modifications, or issuance of orders for the purchase of component parts to accomplish emission control or process modification;

(3) Initiation of on-site construction or installation of emission control equipment or process change;

(4) Completion of on-site construction or installation of emission control equipment or process change; and

(5) Final compliance.

(i) "Region" means an air quality control region designated under section 107 of the Act and described in Part 81 of this chapter.

(j) "Local agency" means any local governmental agency.

§ 60.22 Publication of guideline documents, emission guidelines, and final compliance times.

(a) After promulgation of a standard of performance for the control of a designated pollutant from affected facilities, the Administrator will publish a draft guideline document containing information pertinent to control of the designated pollutant from designated facilities. Notice of the availability of the draft guideline document will be published in the FEDERAL REGISTER, and public comments on its contents will be invited. After consideration of public comments, a final guideline document will be published and notice of its availability will be published in the FEDERAL REGISTER.

(b) Guideline documents published under this section will provide information for the development of State plans, such as:

(1) Information concerning known or suspected endangerment of public health or welfare caused, or contributed to, by the designated pollutant.

(2) A description of systems of emission reduction which, in the judgment of the Administrator, have been adequately demonstrated.

(3) Information on the degree of emission reduction which is achievable

with each system, together with information on the costs and environmental effects of applying each system to designated facilities.

(4) Incremental periods of time normally expected to be necessary for the design, installation, and startup of identified control systems.

(5) An emission guideline that reflects the application of the best system of emission reduction (considering the cost of such reduction) that has been adequately demonstrated for designated facilities, and the time within which compliance with emission standards of equivalent stringency can be achieved. The Administrator will specify different emission guidelines or compliance times or both for different sizes, types, and classes of designated facilities when costs of control, physical limitations, geographical location, or similar factors make subcategorization appropriate.

(6) Such other available information as the Administrator determines may contribute to the formulation of State plans.

(c) Except as provided in paragraph (d)(1) of this section, the emission guidelines and compliance times referred to in paragraph (b)(5) of this section will be proposed for comment upon publication of the draft guideline document, and after consideration of comments will be promulgated in Subpart C of this part with such modifications as may be appropriate.

(d)(1) If the Administrator determines that a designated pollutant may cause or contribute to endangerment of public welfare, but that adverse effects on public health have not been demonstrated, he will include the determination in the draft guideline document and in the FEDERAL REGISTER notice of its availability. Except as provided in paragraph (d)(2) of this section, paragraph (c) of this section shall be inapplicable in such cases.

(2) If the Administrator determines at any time on the basis of new information that a prior determination under paragraph (d)(1) of this section is incorrect or no longer correct, he will publish notice of the determination in the FEDERAL REGISTER, revise the guideline document as necessary under paragraph (a) of this section, and propose and promulgate emission guidelines and compliance times under paragraph (c) of this section.

§ 60.23 Adoption and submittal of State plans; public hearings.

(a)(1) Within nine months after notice of the availability of a final guideline document is published under § 60.22(a), each State shall adopt and submit to the Administrator, in accordance with § 60.4, a plan for the control of the designated pollutant to which the guideline document applies.

(2) Within nine months after notice of the availability of a final revised guideline document is published as provided in § 60.22(d)(2), each State shall adopt and submit to the Administrator any plan revision necessary to meet the requirements of this subpart.

(b) If no designated facility is located within a State, the State shall submit a letter of certification to that effect to the Administrator within the time specified in paragraph (a) of this section. Such certification shall exempt the State from the requirements of this subpart for that designated pollutant.

(c)(1) Except as provided in paragraphs (c)(2) and (c)(3) of this section, the State shall, prior to the adoption of any plan or revision thereof, conduct one or more public hearings within the State on such plan or plan revision.

(2) No hearing shall be required for any change to an increment of progress in an approved compliance schedule unless the change is likely to cause the facility to be unable to comply with the final compliance date in the schedule.

(3) No hearing shall be required on an emission standard in effect prior to the effective date of this subpart if it was adopted after a public hearing and is at least as stringent as the corresponding emission guideline specified in the applicable guideline document published under § 60.22(a).

(d) Any hearing required by paragraph (c) of this section shall be held only after reasonable notice. Notice shall be given at least 30 days prior to the date of such hearing and shall include:

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(1) Notification to the public by prominently advertising the date, time, and place of such hearing in each region affected;

(2) Availability, at the time of public announcement, of each proposed plan or revision thereof for public inspection in at least one location in each region to which it will apply;

(3) Notification to the Administrator;

(4) Notification to each local air pollution control agency in each region to which the plan or revision will apply; and

(5) In the case of an interstate region, notification to any other State included in the region.

(e) The State shall prepare and retain, for a minimum of 2 years, a record of each hearing for inspection by any interested party. The record shall contain, as a minimum, a list of witnesses together with the text of each presentation.

(f) The State shall submit with the plan or revision:

(1) Certification that each hearing required by paragraph (c) of this section was held in accordance with the notice required by paragraph (d) of this section; and

(2) A list of witnesses and their organizational affiliations, if any, appearing at the hearing and a brief written summary of each presentation or written submission.

(g) Upon written application by a State agency (through the appropriate Regional Office), the Administrator may approve State procedures designed to insure public participation in the matters for which hearings are required and public notification of the opportunity to participate if, in the judgment of the Administrator, the procedures, although different from the requirements of this subpart, in fact provide for adequate notice to and participation of the public. The Administrator may impose such conditions on his approval as he deems necessary. Procedures approved under this section shall be deemed to satisfy the requirements of this subpart regarding procedures for public hearings.

§ 60.24 Emission standards and compliance schedules.

(a) Each plan shall include emission standards and compliance schedules.

(b)(1) Emission standards shall prescribe allowable rates of emissions except when it is clearly impracticable. Such cases will be identified in the guideline documents issued under § 60.22. Where emission standards prescribing equipment specifications are established, the plan shall, to the degree possible, set forth the emission reductions achievable by implementation of such specifications, and may permit compliance by the use of equipment determined by the State to be equivalent to that prescribed.

(2) Test methods and procedures for determining compliance with the emission standards shall be specified in the plan. Methods other than those specified in Appendix A to this part may be specified in the plan if shown to be equivalent or alternative methods as defined in § 60.2 (t) and (u).

(3) Emission standards shall apply to all designated facilities within the State. A plan may contain emission standards adopted by local jurisdictions provided that the standards are enforceable by the State.

(c) Except as provided in paragraph (f) of this section, where the Administrator has determined that a designated pollutant may cause or contribute to endangerment of public health, emission standards shall be no less stringent than the corresponding emission guideline(s) specified in Subpart C of this part, and final compliance shall be required as expeditiously as practicable but no later than the compliance times specified in Subpart C of this part.

(d) Where the Administrator has determined that a designated pollutant may cause or contribute to endangerment of public welfare but that adverse effects on public health have not been demonstrated, States may balance the emission guidelines, compliance times, and other information provided in the applicable guideline document against other factors of public concern in establishing emission standards, compliance schedules, and variances. Appropriate consideration

shall be given to the factors specified in § 60.22(b) and to information presented at the public hearing(s) conducted under § 60.23(c).

(e) (1) Any compliance schedule extending more than 12 months from the date required for submittal of the plan shall include legally enforceable increments of progress to achieve compliance for each designated facility or category of facilities. Increments of progress shall include, where practicable, each increment of progress specified in § 60.21(h) and shall include such additional increments of progress as may be necessary to permit close and effective supervision of progress toward final compliance.

(2) A plan may provide that compliance schedules for individual sources or categories of sources will be formulated after plan submittal. Any such schedule shall be the subject of a public hearing held according to § 60.23 and shall be submitted to the Administrator within 60 days after the date of adoption of the schedule but in no case later than the date prescribed for submittal of the first semiannual report required by § 60.25(e).

(f) On a case-by-case basis for particular designated facilities, or classes of facilities, States may provide for the application of less stringent emission standards or longer compliance schedules than those otherwise required by paragraph (c) of this section, provided that the State demonstrates with respect to each such facility (or class of facilities):

(1) Unreasonable cost of control resulting from plant age, location, or basic process design;

(2) Physical impossibility of installing necessary control equipment; or

(3) Other factors specific to the facility (or class of facilities) that make application of a less stringent standard or final compliance time significantly more reasonable.

(g) Nothing in this subpart shall be construed to preclude any State or political subdivision thereof from adopting or enforcing (1) emission standards more stringent than emission guidelines specified in Subpart C of this part or in applicable guideline documents or (2) compliance schedules requiring final compliance at earlier times than those specified in Subpart C or in applicable guideline documents.

(Sec. 116, Clean Air Act, as amended (42 U.S.C. 7416))

[40 FR 53346, Nov. 17, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.25 Emission inventories, source surveillance, reports.

(a) Each plan shall include an inventory of all designated facilities, including emission data for the designated pollutants and information related to emissions as specified in Appendix D to this part. Such data shall be summarized in the plan, and emission rates of designated pollutants from designated facilities shall be correlated with applicable emission standards. As used in this subpart, "correlated" means presented in such a manner as to show the relationship between measured or estimated amounts of emissions and the amounts of such emissions allowable under applicable emission standards.

(b) Each plan shall provide for monitoring the status of compliance with applicable emission standards. Each plan shall, as a minimum, provide for:

(1) Legally enforceable procedures for requiring owners or operators of designated facilities to maintain records and periodically report to the State information on the nature and amount of emissions from such facilities, and/or such other information as may be necessary to enable the State to determine whether such facilities are in compliance with applicable portions of the plan.

(2) Periodic inspection and, when applicable, testing of designated facilities.

(c) Each plan shall provide that information obtained by the State under paragraph (b) of this section shall be correlated with applicable emission standards (see § 60.25(a)) and made available to the general public.

(d) The provisions referred to in paragraphs (b) and (c) of this section shall be specifically identified. Copies of such provisions shall be submitted with the plan unless:

(1) They have been approved as portions of a preceding plan submitted

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under this subpart or as portions of an implementation plan submitted under section 110 of the Act, and

(2) The State demonstrates:

(i) That the provisions are applicable to the designated pollutant(s) for which the plan is submitted, and

(ii) That the requirements of § 60.26 are met.

(e) The State shall submit reports on progress in plan enforcement to the Administrator on an annual (calendar year) basis, commencing with the first full report period after approval of a plan or after promulgation of a plan by the Administrator. Information required under this paragraph must be included in the annual report required by § 51.321 of this chapter.

(f) Each progress report shall include:

(1) Enforcement actions initiated against designated facilities during the reporting period, under any emission standard or compliance schedule of the plan.

(2) Identification of the achievement of any increment of progress required by the applicable plan during the reporting period.

(3) Identification of designated facilities that have ceased operation during the reporting period.

(4) Submission of emission inventory data as described in paragraph (a) of this section for designated facilities that were not in operation at the time of plan development but began operation during the reporting period.

(5) Submission of additional data as necessary to update the information submitted under paragraph (a) of this section or in previous progress reports.

(6) Submission of copies of technical reports on all performance testing on designated facilities conducted under paragraph (b)(2) of this section, complete with concurrently recorded process data.

(Sec. 110, 301(a), 319 of the Clean Air Act as amended (42 U.S.C. 7410, 7601(a), 7619))

[40 FR 53346, Nov. 17, 1975, as amended at 44 FR 65071, Nov. 9, 1979]

§ 60.26 Legal authority.

(a) Each plan shall show that the State has legal authority to carry out the plan, including authority to:

(1) Adopt emission standards and compliance schedules applicable to designated facilities.

(2) Enforce applicable laws, regulations, standards, and compliance schedules, and seek injunctive relief.

(3) Obtain information necessary to determine whether designated facilities are in compliance with applicable laws, regulations, standards, and compliance schedules, including authority to require recordkeeping and to make inspections and conduct tests of designated facilities.

(4) Require owners or operators of designated facilities to install, maintain, and use emission monitoring devices and to make periodic reports to the State on the nature and amounts of emissions from such facilities; also authority for the State to make such data available to the public as reported and as correlated with applicable emission standards.

(b) The provisions of law or regulations which the State determines provide the authorities required by this section shall be specifically identified. Copies of such laws or regulations shall be submitted with the plan unless:

(1) They have been approved as portions of a preceding plan submitted under this subpart or as portions of an implementation plan submitted under section 110 of the Act, and

(2) The State demonstrates that the laws or regulations are applicable to the designated pollutant(s) for which the plan is submitted.

(c) The plan shall show that the legal authorities specified in this section are available to the State at the time of submission of the plan. Legal authority adequate to meet the requirements of paragraphs (a)(3) and (4) of this section may be delegated to the State under section 114 of the Act.

(d) A State governmental agency other than the State air pollution control agency may be assigned responsibility for carrying out a portion of a plan if the plan demonstrates to the Administrator's satisfaction that the State governmental agency has the legal authority necessary to carry out that portion of the plan.

(e) The State may authorize a local agency to carry out a plan, or portion

thereof, within the local agency's jurisdiction if the plan demonstrates to the Administrator's satisfaction that the local agency has the legal authority necessary to implement the plan or portion thereof, and that the authorization does not relieve the State of responsibility under the Act for carrying out the plan or portion thereof.

§ 60.27 Actions by the Administrator.

(a) The Administrator may, whenever he determines necessary, extend the period for submission of any plan or plan revision or portion thereof.

(b) After receipt of a plan or plan revision, the Administrator will propose the plan or revision for approval or disapproval. The Administrator will, within four months after the date required for submission of a plan or plan revision, approve or disapprove such plan or revision or each portion thereof.

(c) The Administrator will, after consideration of any State hearing record, promptly prepare and publish proposed regulations setting forth a plan, or portion thereof, for a State if:

(1) The State fails to submit a plan within the time prescribed;

(2) The State fails to submit a plan revision required by § 60.23(a)(2) within the time prescribed; or

(3) The Administrator disapproves the State plan or plan revision or any portion thereof, as unsatisfactory because the requirements of this subpart have not been met.

(d) The Administrator will, within six months after the date required for submission of a plan or plan revision, promulgate the regulations proposed under paragraph (c) of this section with such modifications as may be appropriate unless, prior to such promulgation, the State has adopted and submitted a plan or plan revision which the Administrator determines to be approvable.

(e)(1) Except as provided in paragraph (e)(2) of this section, regulations proposed and promulgated by the Administrator under this section will prescribe emission standards of the same stringency as the corresponding emission guideline(s) specified in the final guideline document published under § 60.22(a) and will require final compliance with such standards as expeditiously as practicable but no later than the times specified in the guideline document.

(2) Upon application by the owner or operator of a designated facility to which regulations proposed and promulgated under this section will apply, the Administrator may provide for the application of less stringent emission standards or longer compliance schedules than those otherwise required by this section in accordance with the criteria specified in § 60.24(f).

(f) If a State failed to hold a public hearing as required by § 60.23(c), the Administrator will provide opportunity for a hearing within the State prior to promulgation of a plan under paragraph (d) of this section.

§ 60.28 Plan revisions by the State.

(a) Plan revisions which have the effect of delaying compliance with applicable emission standards or increments of progress or of establishing less stringent emission standards shall be submitted to the Administrator within 60 days after adoption in accordance with the procedures and requirements applicable to development and submission of the original plan.

(b) More stringent emission standards, or orders which have the effect of accelerating compliance, may be submitted to the Administrator as plan revisions in accordance with the procedures and requirements applicable to development and submission of the original plan.

(c) A revision of a plan, or any portion thereof, shall not be considered part of an applicable plan until approved by the Administrator in accordance with this subpart.

§ 60.29 Plan revisions by the Administrator.

After notice and opportunity for public hearing in each affected State, the Administrator may revise any provision of an applicable plan if:

(a) The provision was promulgated by the Administrator, and

(b) The plan, as revised, will be consistent with the Act and with the requirements of this subpart.

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Subpart C—Emission Guidelines and Compliance Times

AUTHORITY: Sec. 111(d), 301(a) of the Clean Air Act as amended (42 U.S.C. 1857c-6 and 1857g(a)), unless otherwise noted.

SOURCE: 42 FR 55797, Oct. 18, 1977, unless otherwise noted.

§ 60.30 Scope.

This subpart contains emission guidelines and compliance times for the control of certain designated pollutants from certain designated facilities in accordance with section 111(d) of the Act and Subpart B.

§ 60.31 Definitions.

Terms used but not defined in this subpart have the meaning given them in the Act and in Subparts A and B of this part.

§ 60.32 Designated facilities.

(a) Sulfuric acids production units. The designated facility to which §§ 60.33(a) and 60.34(a) apply is each existing "sulfuric acid production unit" as defined in § 60.81(a) of Subpart H.

§ 60.33 Emission guidelines.

(a) Sulfuric acid production units. The emission guideline for designated facilities is 0.25 gram sulfuric acid mist (as measured by Reference Method 8, of Appendix A) per kilogram of sulfuric acid produced (0.5 lb/ton), the production being expressed as 100 percent H_2SO_4.

§ 60.34 Compliance times.

(a) Sulfuric acid production units. Planning, awarding of contracts, and installation of equipment capable of attaining the level of the emission guideline established under § 60.33(a) can be accomplished within 17 months after the affective date of a State emission standard for sulfuric acid mist.

Subpart D—Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction Is Commenced After August 17, 1971

§ 60.40 Applicability and designation of affected facility.

(a) The affected facilities to which the provisions of this subpart apply are:

(1) Each fossil-fuel-fired steam generating unit of more than 73 megawatts heat input rate (250 million Btu per hour).

(2) Each fossil-fuel and wood-residue-fired steam generating unit capable of firing fossil fuel at a heat input rate of more than 73 megawatts (250 million Btu per hour).

(b) Any change to an existing fossil-fuel-fired steam generating unit to accommodate the use of combustible materials, other than fossil fuels as defined in this subpart, shall not bring that unit under the applicability of this subpart.

(c) Except as provided in paragraph (d) of this section, any facility under paragraph (a) of this section that commenced construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(d) The requirements of §§ 60.44(a)(4), (a)(5), (b) and (d), and 60.45(f)(4)(vi) are applicable to lignite-fired steam generating units that commenced construction or modification after December 22, 1976.

(e) Any facility covered under Subpart Da is not covered under this Subpart.

(Secs. 111, 114, and 301(a), Clean Air Act; Sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a), 7411, 7414, and 7601))

[42 FR 37936, July 25, 1977, as amended at 43 FR 9278, Mar. 7, 1978; 44 FR 33612, June 17, 1979]

§ 60.41 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act, and in Subpart A of this part.

(a) "Fossil-fuel fired steam generating unit" means a furnace or boiler

used in the process of burning fossil fuel for the purpose of producing steam by heat transfer.

(b) "Fossil fuel" means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.

(c) "Coal refuse" means waste-products of coal mining, cleaning, and coal preparation operations (e.g. culm, gob, etc.) containing coal, matrix material, clay, and other organic and inorganic material.

(d) "Fossil fuel and wood residue-fired steam generating unit" means a furnace or boiler used in the process of burning fossil fuel and wood residue for the purpose of producing steam by heat transfer.

(e) "Wood residue" means bark, sawdust, slabs, chips, shavings, mill trim, and other wood products derived from wood processing and forest management operations.

(f) "Coal" means all solid fuels classified as anthracite, bituminous, subbituminous, or lignite by the American Society for Testing Material. Designation D 388-66.

(Secs. 111 and 301(a), Clean air Act, as amended (42 U.S.C. 7411, 7414, and 7601))

[39 FR 20791, June 14, 1974, as amended at 40 FR 2803, Jan. 16, 1975; 41 FR 51398, Nov. 22, 1976; 43 FR 9278, Mar. 7, 1978]

§ 60.42 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of 43 nanograms per joule heat input (0.10 lb per million Btu) derived from fossil fuel or fossil fuel and wood residue.

(2) Exhibit greater than 20 percent opacity except for one six-minute period per hour of not more than 27 percent opacity.

(b)(1) On or after December 28, 1979, no owner or operator shall cause to be discharged into the atmosphere from the Southwestern Public Service Company's Harrington Station #1, in Amarillo, Texas, any gases which exhibit greater than 35% opacity, except that a maximum or 42% opacity shall be permitted for not more than 6 minutes in any hour.

(2) Interstate Power Company shall not cause to be discharged into the atmosphere from its Lansing Station Unit No. 4 in Lansing, Iowa, any gases which exhibit greater than 32% opacity, except that a maximum of 39% opacity shall be permitted for not more than six minutes in any hour.

(3) Omaha Public Power District shall not cause to be discharged into the atmosphere from its Nebraska City Power Station in Nebraska City, Nebraska, any gases which exhibit greater than 30% opacity, except that a maximum of 37% opacity shall be permitted for not more than six minutes in any hour.

(Sec. 111, 301(a), Clean Air Act as amended (42 U.S.C. 7411, 7601))

[39 FR 20792, June 14, 1974, as amended at 41 FR 51398, Nov. 22, 1976; 42 FR 61537, Dec. 5, 1977; 44 FR 76787, Dec. 28, 1979; 45 FR 36077, May 29, 1980; 45 FR 47146, July 14, 1980; 46 FR 57498, Nov. 24, 1981]

§ 60.43 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain sulfur dioxide in excess of:

(1) 340 nanograms per joule heat input (0.80 lb per million Btu) derived from liquid fossil fuel or liquid fossil fuel and wood residue.

(2) 520 nanograms per joule heat input (1.2 lb per million Btu) derived from solid fossil fuel or solid fossil fuel and wood residue.

(b) When different fossil fuels are burned simultaneously in any combination, the applicable standard (in ng/J) shall be determined by proration using the following formula:

$$PS_{so_2} = [y(340) + z(520)]/y + z$$

where:

PS_{so_2} is the prorated standard for sulfur dioxide when burning different fuels simultaneously, in nanograms per joule heat input derived from all fossil fuels

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fired or from all fossil fuels and wood residue fired,

y is the percentage of total heat input derived from liquid fossil fuel, and

z is the percentage of total heat input derived from solid fossil fuel.

(c) Compliance shall be based on the total heat input from all fossil fuels burned, including gaseous fuels.

[39 FR 20792, June 14, 1974, as amended at 41 FR 51398, Nov. 22, 1976]

§ 60.44 Standard for nitrogen oxides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain nitrogen oxides, expressed as NO_2 in excess of:

(1) 86 nanograms per joule heat input (0.20 lb per million Btu) derived from gaseous fossil fuel or gaseous fossil fuel and wood residue.

(2) 130 nanograms per joule heat input (0.30 lb per million Btu) derived from liquid fossil fuel or liquid fossil fuel and wood residue.

(3) 300 nanograms per joule heat input (0.70 lb per million Btu) derived from solid fossil fuel or solid fossil fuel and wood residue (except lignite or a solid fossil fuel containing 25 percent, by weight, or more of coal refuse).

(4) 260 nanograms per joule heat input (0.60 lb per million Btu) derived from lignite or lignite and wood residue (except as provided under paragraph (a)(5) of this section).

(5) 340 nanograms per joule heat input (0.80 lb per million Btu) derived from lignite which is mined in North Dakota, South Dakota, or Montana and which is burned in a cyclone-fired unit.

(b) Except as provided under paragraphs (c) and (d) of this section, when different fossil fuels are burned simultaneously in any combination, the applicable standard (in ng/J) is determined by proration using the following formula:

$$PS_{NO_2} = \frac{w(260) + x(86) + y(130) + z(300)}{w + x + y + z}$$

where:

PS_{NO_2} = is the prorated standard for nitrogen oxides when burning different fuels simultaneously, in nanograms per joule heat input derived from all fossil fuels fired or from all fossil fuels and wood residue fired;

w = is the percentage of total heat input derived from lignite;

x = is the percentage of total heat input derived from gaseous fossil fuel;

y = is the percentage of total heat input derived from liquid fossil fuel; and

z = is the percentage of total heat input derived from solid fossil fuel (except lignite).

(c) When a fossil fuel containing at least 25 percent, by weight, of coal refuse is burned in combination with gaseous, liquid, or other solid fossil fuel or wood residue, the standard for nitrogen oxides does not apply.

(d) Cyclone-fired units which burn fuels containing at least 25 percent of lignite that is mined in North Dakota, South Dakota, or Montana remain subject to paragraph (a)(5) of this section regardless of the types of fuel combusted in combination with that lignite.

(Secs. 111 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411, and 7601))

[39 FR 20792, June 14, 1974, as amended at 41 FR 51398, Nov. 22, 1976; 43 FR 9278, Mar. 7, 1978]

§ 60.45 Emission and fuel monitoring.

(a) Each owner or operator shall install, calibrate, maintain, and operate continuous monitoring systems for measuring the opacity of emissions, sulfur dioxide emissions, nitrogen oxides emissions, and either oxygen or carbon dioxide except as provided in paragraph (b) of this section.

(b) Certain of the continuous monitoring system requirements under paragraph (a) of this section do not apply to owners or operators under the following conditions:

(1) For a fossil fuel-fired steam generator that burns only gaseous fossil fuel, continuous monitoring systems for measuring the opacity of emissions and sulfur dioxide emissions are not required.

(2) For a fossil fuel-fired steam generator that does not use a flue gas desulfurization device, a continuous monitoring system for measuring

sulfur dioxide emissions is not required if the owner or operator monitors sulfur dioxide emissions by fuel sampling and analysis under paragraph (d) of this section.

(3) Notwithstanding § 60.13(b), installation of a continuous monitoring system for nitrogen oxides may be delayed until after the initial performance tests under § 60.8 have been conducted. If the owner or operator demonstrates during the performance test that emissions of nitrogen oxides are less than 70 percent of the applicable standards in § 60.44, a continuous monitoring system for measuring nitrogen oxides emissions is not required. If the initial performance test results show that nitrogen oxide emissions are greater than 70 percent of the applicable standard, the owner or operator shall install a continuous monitoring system for nitrogen oxides within one year after the date of the initial performance tests under § 60.8 and comply with all other applicable monitoring requirements under this part.

(4) If an owner or operator does not install any continuous monitoring systems for sulfur oxides and nitrogen oxides, as provided under paragraphs (b)(1) and (b)(3) or paragraphs (b)(2) and (b)(3) of this section a continuous monitoring system for measuring either oxygen or carbon dioxide is not required.

(c) For performance evaluations under § 60.13(c) and calibration checks under § 60.13(d), the following procedures shall be used:

(1) Reference Methods 6 or 7, as applicable, shall be used for conducting performance evaluations of sulfur dioxide and nitrogen oxides continuous monitoring systems.

(2) Sulfur dioxide or nitric oxide, as applicable, shall be used for preparing calibration gas mixtures under Performance Specification 2 of Appendix B to this part.

(3) For affected facilities burning fossil fuel(s), the span value for a continuous monitoring system measuring the opacity of emissions shall be 80, 90, or 100 percent and for a continuous monitoring system measuring sulfur oxides or nitrogen oxides the span value shall be determined as follows:

[In parts per million]

Fossil fuel	Span value for sulfur dioxide	Span value for nitrogen oxides
Gas	(1)	500
Liquid	1,000	500
Solid	1,500	500
Combinations	$1{,}000y + 1{,}500z$	$500(x+y) + 1{,}000z$

[1] Not applicable.

where:

x = the fraction of total heat input derived from gaseous fossil fuel, and

y = the fraction of total heat input derived from liquid fossil fuel, and

z = the fraction of total heat input derived from solid fossil fuel.

(4) All span values computed under paragraph (c)(3) of this section for burning combinations of fossil fuels shall be rounded to the nearest 500 ppm.

(5) For a fossil fuel-fired steam generator that simultaneously burns fossil fuel and nonfossil fuel, the span value of all continuous monitoring systems shall be subject to the Administrator's approval.

(d) [Reserved]

(e) For any continuous monitoring system installed under paragraph (a) of this section, the following conversion procedures shall be used to convert the continuous monitoring data into units of the applicable standards (ng/J, lb/million Btu):

(1) When a continuous monitoring system for measuring oxygen is selected, the measurement of the pollutant concentration and oxygen concentration shall each be on a consistent basis (wet or dry). Alternative procedures approved by the Administrator shall be used when measurements are on a wet basis. When measurements are on a dry basis, the following conversion procedure shall be used:

$$E = CF[20.9/20.9 - \text{percent } O_2]$$

where:

E, C, F, and $\%O_2$ are determined under paragraph (f) of this section.

(2) When a continuous monitoring system for measuring carbon dioxide is selected, the measurement of the pollutant concentration and carbon dioxide concentration shall each be on a consistent basis (wet or dry) and the

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following conversion procedure shall be used:

$$E = CF_c\ [100/\text{percent } CO_2]$$

where:

E, C, F_c and $\%CO_2$ are determined under paragraph (f) of this section.

(f) The values used in the equations under paragraphs (e) (1) and (2) of this section are derived as follows:

(1) E=pollutant emissions, ng/J (lb/million Btu).

(2) C=pollutant concentration, ng/dscm (lb/dscf), determined by multiplying the average concentration (ppm) for each one-hour period by 4.15×10^{4} M ng/dscm per ppm (2.59×10^{-9} M lb/dscf per ppm) where M=pollutant molecular weight, g/g-mole (lb/lb-mole). M=64.07 for sulfur dioxide and 46.01 for nitrogen oxides.

(3) $\%O_2$, $\%CO_2$=oxygen or carbon dioxide volume (expressed as percent), determined with equipment specified under paragraph (d) of this section.

(4) F, F_c=a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted (F), and a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted (F_c), respectively. Values of F and F_c are given as follows:

(i) For anthracite coal as classified according to A.S.T.M. D 388-66, $F=2.723\times10^{-17}$ dscm/J (10,140 dscf/million Btu) and $F_c=0.532\times10^{-17}$ scm CO_2/J (1,980 scf CO_2/million Btu).

(ii) For subbituminous and bituminous coal as classified according to A.S.T.M. D 388-66, $F=2.637\times10^{-7}$ dscm/J (9,820 dscf/million Btu) and $F_c=0.486\times10^{-7}$ scm CO_2/J (1,810 scf CO_2/million Btu).

(iii) For liquid fossil fuels including crude, residual, and distillate oils, $F=2.476\times10^{-7}$ dscm/J (9,220 dscf/million Btu) and $F_c=0.384\times10^{-7}$ scm CO_2/J (1,430 scf CO_2/million Btu).

(iv) For gaseous fossil fuels, $F=2.347\times10^{-7}$ dscm/J (8,740 dscf/million Btu). For natural gas, propane, and butane fuels, $F_c=0.279\times10^{-7}$ scm CO_2/J (1,040 scf CO_2/million Btu) for natural gas, 0.322×10^{-7} scm CO_2/J (1,200 scf CO_2/million Btu) for propane, and 0.338×10^{-7} scm CO_2/J (1,260 scf CO_2/million Btu) for butane.

(v) For bark $F=2.589\times10^{-7}$ dscm/J (9,640 dscf/million Btu) and $F_c=0.500\times10^{-7}$ scm CO_2/J (1,840 scf CO_2/ million Btu). For wood residue other than bark $F=2.492\times10^{-7}$ dscm/J (9,280 dscf/million Btu) and $F_c=0.494\times10^{-7}$ scm CO_2/J (1,860 scf CO_2/ million Btu).

(vi) For lignite coal as classified according to A.S.T.M. D 388-66, $F=2.659\times10^{-7}$ dscm/J (9900 dscf/million Btu) and $F_c=0.516\times10^{-7}$ scm CO_2/J (1920 scf CO_2/million Btu).

(5) The owner or operator may use the following equation to determine an F factor (dscm/J or dscf/million Btu) on a dry basis (if it is desired to calculate F on a wet basis, consult the Administrator) or F_c factor (scm CO_2/J, or scf CO_2/million Btu) on either basis in lieu of the F or F_c factors specified in paragraph (f)(4) of this section:

$$F = 10^{-6}\,\frac{[227.2\ (\text{pct. H}) + 95.5\ (\text{pct. C}) + 35.6\ (\text{pct. S}) + 8.7\ (\text{pct. N}) - 28.7\ (\text{pct. O})]}{\text{GCV}}$$

$$F_c = \frac{2.0\times10^{-6}\ (\text{pct. C})}{\text{GCV}}.$$

(SI units)

$$F=\frac{10^6[3.64(\%H)+1.53(\%C)+0.57(\%S)+0.14(\%N)-0.46(\%O)]}{GCV}$$

(English units)

$$F_c=\frac{20.0(\%C)}{GCV}$$

(SI units)

$$F_c=\frac{321\times10^3(\%C)}{GCV}$$

(English units)

(i) H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent), respectively, as determined on the same basis as GCV by ultimate analysis of the fuel fired, using A.S.T.M. method D3178-74 or D3176 (solid fuels), or computed from results using A.S.T.M. methods D1137-53(70), D1945-64(73), or D1946-67(72) (gaseous fuels) as applicable.

(ii) GCV is the gross calorific value (kJ/kg, Btu/lb) of the fuel combusted, determined by the A.S.T.M. test methods D2015-66(72) for solid fuels and D 1826-64(70) for gaseous fuels as applicable.

(iii) For affected facilities which fire both fossil fuels and nonfossil fuels, the F or F_c value shall be subject to the Administrator's approval.

(6) For affected facilities firing combinations of fossil fuels or fossil fuels and wood residue, the F or F_c factors determined by paragraphs (f)(4) or (f)(5) of this section shall be prorated in accordance with the applicable formula as follows:

$$F=\sum_{i=1}^{n}X_iF_i \text{ or } F_c=\sum_{i=1}^{n}X_i(F_c)_i$$

where:

X_i=the fraction of total heat input derived from each type of fuel (e.g. natural gas, bituminous coal, wood residue, etc.)

F_i or $(F_c)_i$=the applicable F or F_c factor for each fuel type determined in accordance with paragraphs (f)(4) and (f)(5) of this section.

n=the number of fuels being burned in combination.

(g) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) *Opacity.* Excess emissions are defined as any six-minute period during which the average opacity of emissions exceeds 20 percent opacity, except that one six-minute average per hour of up to 27 percent opacity need not be reported.

(i) For sources subject to the opacity standard of § 60.42(b)(1), excess emissions are defined as any six-minute period during which the average opacity of emissions exceeds 35 percent opacity, except that one six-minute average per hour of up to 42 percent opacity need not be reported.

(ii) For sources subject to the opacity standard of § 60.42(b)(2), excess emissions are defined as any six-minute period during which the average opacity of emissions exceeds 32 percent opacity, except that one six-minute average per hour of up to 39 percent opacity need not be reported.

(iii) For sources subject to the opacity standard of § 60.42(b)(3), excess emissions are defined as any six-minute period during which the average opacity of emissions exceeds 30 percent opacity, except that one six-minute

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average per hour of up to 37 percent opacity need not be reported.

(2) *Sulfur dioxide.* Excess emissions for affected facilities are defined as:

(i) Any three-hour period during which the average emissions (arithmetic average of three contiguous one-hour periods) of sulfur dioxide as measured by a continuous monitoring system exceed the applicable standard under § 60.43.

(3) *Nitrogen oxides.* Excess emissions for affected facilities using a continuous monitoring system for measuring nitrogen oxides are defined as any three-hour period during which the average emissions (arithmetic average of three contiguous one-hour periods) exceed the applicable standards under § 60.44.

(Secs. 111, 114, and 301(a), Clean Air Act, as amended (42 U.S.C. 7411, 7414, and 7601))

[40 FR 46256, Oct. 6, 1975; 40 FR 59205, Dec. 22, 1975, as amended at 41 FR 51399, Nov. 22, 1976; 42 FR 5936, Jan. 31, 1977; 42 FR 41122, Aug. 15, 1977; 42 FR 61537, Dec. 5, 1977; 43 FR 8800, Mar. 3, 1978; 43 FR 9278, Mar. 7, 1978; 44 FR 76787, Dec. 28, 1979; 45 FR 47146, July 14, 1980; 46 FR 57498, Nov. 24, 1981]

§ 60.46 Test methods and procedures.

(a) The reference methods in Appendix A of this part, except as provided in § 60.8(b), shall be used to determine compliance with the standards as prescribed in §§ 60.42, 60.43, and 60.44 as follows:

(1) Method 1 for selection of sampling site and sample traverses.

(2) Method 3 for gas analysis to be used when applying Reference Methods 5, 6 and 7.

(3) Method 5 for concentration of particulate matter and the associated moisture content.

(4) Method 6 for concentration of SO_2, and

(5) Method 7 for concentration of NO_x.

(b) For Method 5, Method 1 shall be used to select the sampling site and the number of traverse sampling points. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf) except that smaller sampling times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator. The probe and filter holder heating systems in the sampling train shall be set to provide a gas temperature no greater than 433 K (320°F).

(c) For Methods 6 and 7, the sampling site shall be the same as that selected for Method 5. The sampling point in the duct shall be at the centroid of the cross section or at a point no closer to the walls than 1 m (3.28 ft). For Method 6, the sample shall be extracted at a rate proportional to the gas velocity at the sampling point.

(d) For Method 6, the minimum sampling time shall be 20 minutes and the minimum sampling volume 0.02 dscm (0.71 dscf) for each sample. The arithmetic mean of two samples shall constitute one run. Samples shall be taken at approximately 30-minute intervals.

(e) For Method 7, each run shall consist of at least four grab samples taken at approximately 15-minute intervals. The arithmetic mean of the samples shall constitute the run value.

(f) For each run using the methods specified by paragraphs (a)(3), (a)(4), and (a)(5) of this section, the emissions expressed in ng/J (lb/million Btu) shall be determined by the following procedure:

$$E = CF(20.9/20.9 - \text{percent } O_2)$$

where:

(1) E=pollutant emission ng/J (lb/million Btu).

(2) C=pollutant concentration, ng/dscm (lb/dscf), determined by method 5, 6, or 7.

(3) Percent O_2=oxygen content by volume (expressed as percent), dry basis. Percent oxygen shall be determined by using the integrated or grab sampling and analysis procedures of Method 3 as applicable.

The sample shall be obtained as follows:

(i) For determination of sulfur dioxide and nitrogen oxides emissions, the oxygen sample shall be obtained simultaneously at the same point in the duct as used to obtain the samples for Methods 6 and 7 determinations, respectively [§ 60.46(c)]. For Method 7, the oxygen sample shall be obtained

using the grab sampling and analysis procedures of Method 3.

(ii) For determination of particulate emissions, the oxygen sample shall be obtained simultaneously by traversing the duct at the same sampling location used for each run of Method 5 under paragraph (b) of this section. Method 1 shall be used for selection of the number of traverse points except that no more than 12 sample points are required.

(4) F=a factor as determined in paragraphs (f) (4), (5) or (6) of § 60.45.

(g) When combinations of fossil fuels or fossil fuel and wood residue are fired, the heat input, expressed in watts (Btu/hr), is determined during each testing period by multiplying the gross calorific value of each fuel fired (in J/kg or Btu/lb) by the rate of each fuel burned (in kg/sec or lb/hr). Gross calorific values are determined in accordance with A.S.T.M. methods D 2015-66(72) (solid fuels), D 240-64(73) (liquid fuels), or D 1826-64(7) (gaseous fuels) as applicable. The method used to determine calorific value of wood residue must be approved by the Administrator. The owner or operator shall determine the rate of fuels burned during each testing period by suitable methods and shall confirm the rate by a material balance over the steam generation system.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 46258, Oct. 6, 1975, as amended at 41 FR 53199, Nov. 22, 1976; 43 FR 8800, Mar. 3, 1978]

§ 60.47 Innovative technology waivers; waiver of sulfur dioxide standards of performance for new stationary sources for Homer City Unit No. 3 under section 111(j) of the Clean Air Act for Multi-Steam Coal Cleaning System.

(a) Pursuant to section 111(j) of the Clean Air Act, 42 U.S.C. 7411(j), commencing on November 13, 1981 Pennsylvania Electric Company and New York State Electric & Gas Corporation shall comply with the following terms and conditions for electric generating Units Nos. 1, 2, and 3 at the Homer City Steam Electric Generating Station, Center Township, Indiana County, Pennsylvania.

(b) The foregoing terms and conditions shall remain effective through November 30, 1981, and pursuant to section 111(j)(B), shall be Federally promulgated standards of performance. As such, it shall be unlawful for Pennsylvania Electric Company and New York State Electric & Gas Corporation to operate Units Nos. 1, 2, and 3 in violation of the standards of performance established in this waiver. Violations of the terms and conditions of this waiver shall subject Pennsylvania Electric Company and New York State Electric & Gas Corporation to Federal enforcement under sections 113 (b) and (c), 42 U.S.C. 7413 (b) and (c), and 120, 42 U.S.C. 7420, of the Act as well as possible citizen enforcement under section 304 of the Act, 42 U.S.C. 7604. Pursuant to section 111(c)(1) of the Act, 42 U.S.C. 7411(c)(1), at 45 FR 3109, January 16, 1980, the Administrator delegated to the Commonwealth of Pennsylvania authority to implement and enforce the Federal Standards of Performance for New Stationary Sources of 1.2 lb $SO_2/10^6$ Btu applicable to Homer City Unit No. 3. The SO_2 emission limitations specified in this waiver for Unit No. 3 are new Federally promulgated Standards of Performance for New Stationary Sources for a limited time period. Thus, during the period this waiver is effective, the delegated authority of the Commonwealth of Pennsylvania to enforce the Federal Standards of Performance for New Stationary Sources of 1.2 lb $SO_2/10^6$ Btu applicable to Homer City Unit No. 3 is superseded and enforcement of the terms and conditions of this waiver shall be the responsibility of the Administrator of EPA. The Commonwealth of Pennsylvania may, and is encouraged to, seek delegation of authority, pursuant to section 111(c)(1), to enforce the temporary Federal Standards of Performance for New Stationary Sources specified in this waiver. Should such authority be delegated to the State, the terms and conditions of this waiver shall be enforceable by the Administrator of EPA and the Commonwealth of Pennsylvania, concurrently. Nothing in this waiver shall affect the

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rights of the Commonwealth of Pennsylvania under the Decree filed in the Pennsylvania Commonwealth Court on January 28, 1981, at Docket No. 161 C.D. 1981.

(c) On December 1, 1981, and continuing thereafter, at no time shall emissions of SO_2 from Unit No. 3 exceed 1.2 lb/10^6 Btu of heat input, as specified in 40 CFR 60.43(a)(2) (July 1, 1979).

(d) On January 15, 1982, Pennsylvania Electric Company and New York State Electric & Gas Corporation shall demonstrate compliance at Homer City Unit No. 3 with 40 CFR 60.43(a)(2) (July 1, 1979) in accordance with the test methods and procedures set forth in 40 CFR 60.8 (b), (c), (d), (e) and (f) (July 1, 1979).

(e) Emission limitations. (1) Commencing on November 13, 1981 and continuing until November 30, 1981:

(i) At no time shall emissions of SO_2 from Units Nos. 1, 2, and 3, combined,[1] exceed: 2.87 lb SO_2/10^6 Btu of heat input in a rolling 30-day period (starting with the 60th day after the effective date of the waiver); 3.6 lb SO_2/10^6 Btu of heat input in any day;[1] and 3.1 lb SO_2/10^6 Btu of heat input on more than 4 days in any rolling 30-day period.

(ii) At no time shall emissions of SO_2 from Units Nos. 1, 2, and 3, combined,[2] exceed 695 tons in any day.

(iii) At no time shall emissions of SO_2 from Units Nos. 1, 2, and 3, combined,[2] exceed 91 tons in any discrete [1] 3-hour period.

(iv) At no time shall emissions of SO_2 from Units Nos. 1 and 2, combined, exceed 463 tons in any day.

(v) At no time shall emissions of SO_2 from Units Nos. 1 and 2, combined, exceed 61 tons in any discrete [1] 3-hour period.

(f) Installation Schedule. (1) Pennsylvania Electric and New York State Electric & Gas have selected engineering designs for necessary modifications to the Multi-Stream Coal Cleaning System (MCCS) 93B Circuit.

(2) Pennsylvania Electric and New York State Electric & Gas have placed purchase orders for all major equipment necessary to complete necessary modifications to the MCCS 93B circuit.

(3) Pennsylvania Electric and New York State Electric & Gas have completed design engineering of the modifications to the MCCS 93B circuit.

(4) On or before September 15, 1981, Pennsylvania Electric and New York State Electric & Gas shall complete construction of the MCCS 93B circuit.

(5) On or before October 15, 1981, Pennsylvania Electric and New York State Electric & Gas shall start-up the MCCS 93B circuit.

(g) Monitoring and Reporting. Throughout the waiver period the Company shall acquire sufficient quantities of emission monitoring and fuel analysis data to continuously demonstrate compliance with the combined emission limitations. The Company shall acquire heat input and emission data (sufficient to demonstrate compliance) from each boiler during all operating periods (i.e., whenever fuel is being fired), including periods of process start-up, shutdown, and malfunction. This requirement shall be met through the use of continuous emission monitoring systems (CEMS) [or as supplemented by continuous bubbler (CB) systems], heating value as determined by as-fired fuel analysis, and coal mass feedrate measurements.

(1) Continuous Emission Monitoring System (CEMS): Primary Compliance Monitoring Method:

(i) The Company shall install, test, operate, and maintain all CEMS as the primary compliance monitoring method in such a manner as to result in the acquisition of validated data which are representative of each boiler's 3-hour, 24-hour, and 30-day emission rates. (See paragraph (g)(7) of this section.)

(ii) The validity of the emission data obtained with CEMS shall be determined initially by conducting a performance specification test (PST). Subsequent CEMS data validations shall be performed in accordance with paragraphs (g)(6) and (g)(7) of this section. All PSTs of CEMS shall in-

[1] A "day" (a 24-hour period) and a "discrete 3-hour period" is defined in section (g)(7)(iv).

[2] The procedures used for calculating combined SO_2 emissions are given in paragraph (g)(5) of this section.

clude at least: (A) All of the specifications and test procedures contained in the January 26, 1981 proposed Performance Specifications 2 and 3 (Ref. 1), 46 FR 8352; and (B) the calibration error and response time specifications and test procedures contained in the October 10, 1979 proposed Performance Specifications 2 and 3 (Ref. 2), 44 FR 58602. The calibration error, response time, and all drift tests shall be conducted using calibration gases which conform to the requirements of paragraph (g)(6)(iii) of this section.

(2) Continuous Bubbler System (CB): Secondary Compliance Test Method:

(i) The Company shall use the CB system as a secondary compliance monitoring method to supplement CEMS data whenever a CEMS is out of service or is otherwise providing data of insufficient quality or quantity. The CB technique shall also be used to periodically assess the validity of CEMS data (See paragraph (g)(6)(i)(C) of this section).

(ii) The CB technique for quantitatively assessing SO_2 emissions (in lb/10^6 Btu) is delineated in Appendix I of this waiver. This technique is based upon combining the basic wet-chemical technique of EPA's Reference Method 6 at 40 CFR Part 60, Appendix I, July 1, 1979, (for determining SO_2 concentrations) with the gravimetric method (absorption of CO_2 onto ascarite) for determining CO_2 concentrations. Using reduced flow rates and increased reagent volumes and concentrations, the CB system may be run for much longer periods of time than Reference Method 6 at 40 CFR Part 60, Appendix I (July 1, 1979). The Company may make the following modifications to the CB method as long as they periodically demonstrate that their modified CB method meets the performance criteria of paragraph (g)(6)(ii) of this section:

(A) Use a heated sample probe

(B) Use an in-stack filter (up stream of the impingers) to remove particulate matter

(C) Eliminate the isopropanol (initial) impingers

(D) Use a diaphragm pump with flow regulators in place of the peristaltic pump

(iii) The Company shall initially demonstrate its proficiency in acquiring SO_2/CO_2 data with the CB method by comparing the results obtained using the CB method with those obtained using Reference Methods 3 and 6 (See Ref. 3 and paragraph (g)(6)(ii)(B) of this section). The CB data shall be deemed initially acceptable if the results of this test are within the limits prescribed in paragraph (g)(6)(ii) (A) and (B) of this section. Subsequently, the CB data shall be periodically revalidated as per the QA requirements of paragraph (g)(6)(ii) (A) and (B) of this section.

(3) Requirements for Obtaining 3-hour and 24-hour Emission Data from Individual Boilers: Using the methods set forth in this waiver, the Company shall obtain the following quantities of 3-hour and 24-hour emission data. Failure to acquire the specified quantity or quality of data shall constitute a violation of the terms and conditions of this waiver.

(i) Data and calculation requirements for continuous emission monitoring system (CEMS). During normal operation of a CEMS (primary compliance method) to obtain emission data from one or more of Units Nos. 1, 2, and 3, the Company shall obtain the following data from each CEMS:

(A) 3-hour discrete averaging times using CEMS.—For each boiler, continuously measure and calculate eight discrete 3-hour averages each day, using the three consecutive (exclusive of exemptions below) 1-hour emission averages (each consisting of four equally spaced data points per 1-hour period). The only periods when CEMS measurements are exempted are periods of routine maintenance (as specified in the Lear Siegler Operator's Manual) and as required for daily zero/span checks and calibrations. Such exemptions notwithstanding, at no time shall less than six discrete 3-hour averages per day be obtained. Note that in calculations each 3-hour average one only uses the data available from that specific discrete average.

(B) 24-hour averaging times using CEMS. For each boiler, continuously measure and calculate one discrete 24-hour average per day, using the available (18-24) 1-hour emission averages

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obtained during that specific day. The only periods when CEMS measurements are exempted are periods of routine maintenance (as specified in the Lear Siegler Operator's Manual) and as required for daily zero/span checks and calibrations. Such exemptions notwithstanding, and except for the instances when a boiler operated for only part of the day, at no time shall a calculated 24-hour average consist of less than a total of eighteen 1-hour averages.

(ii) Data requirements when switching from CEMS to CB system. If it becomes necessary to take a CEMS out of service (because of CEMS inoperability or failure to meet the performance requirements (paragraph (g)(6)(i) of the section), the Company shall immediately initiate the activities necessary to begin sampling with the secondary (CB) compliance test method. However, EPA recognizes that some reasonable amount of time will be necessary to diagnose a CEMS problem, to determine whether minor maintenance will be sufficient to resolve the problem, or to determine if the monitoring system must be taken out of service. Additionally, CEMS downtime could occur during the night time shifts or other times when immediate corrective action cannot reasonably be made. Therefore, the waiver requires that at no time shall more than six hours elapse between acceptable operation of the CEMS and the start of CB sampling. All data which are obtained during any interrupted averaging period(s) shall be used to calculate the reported average(s), and the Company shall clearly indicate this data "shortfall" (e.g., acquisition of only 2 hours of data for a 3-hour averaging period) in the subsequent report (See paragraph (g)(8) of this section).

(A) 3-hour averaging times during CEMS-to-CB transition.—During any day in which a transition (from the CEMS) to the secondary compliance method is made, at least four (4) 3-hour average rates of the affected boiler's emissions shall be obtained.

NOTE: At least six (6) 3-hour emission averages are required when a planned CB-to-CEMS transition is performed.

(B) 24-hour averaging times that include a CEMS-to-CB transition. During any day in which a transition (from the CEMS) to the secondary compliance method is made, a 24-hour average rate of the affected boiler's emissions shall be obtained, using the combination of all available 1-hour CEMS emission averages and 3-hour CB emission averages. Such a calculation shall weight (e.g., one CB average is equivalent to three 1-hour CEMS average values) the CB data appropriately.

(iii) Data and calculation requirements for continuous bubbler (CB) monitoring systems. During all periods when a CEMS is out of service and a CB system is in use at one or more of Units Nos. 1, 2, or 3, the Company shall obtain the following data from each CB:

(A) 3-hour averaging times using CB systems. For each boiler being monitored by a CB system, measure and calculate at least six discrete 3-hour emission rates each day.

(B) 24-hour averaging times using CB systems. For each boiler being monitored by the CB method, calculate one 24-hour average emission rate each day. Each average shall be based upon a continuous 24-hour sample.

(4) Requirements for Measuring and Calculating Heat Input Rates:

(i) The Company shall determine the coal feed rate, for each boiler that is being fired, for each 24-hour period in accordance with the Company's standard procedures for weighing coal being fed to the boilers.

(ii) The Company shall determine the heat content (gross calorific value) of the coal, for each boiler being fired and for each 24-hour period, in accordance with the Company's established procedures for as-fired, 24-hour fuel sampling (15-minute sample intervals) and composite automated analysis.

(iii) The Company shall calculate the average heat input rate for each boiler for each 24-hour period (10^6 Btu/24-hours). For each boiler, multiply the average heat content of the coal (Btu/lb) by the coal feed rate as determined for the same 24-hour averaging period.

(iv) The Company shall estimate the average 3-hour heat input rate (10^6 Btu/3-hours) for each boiler from the previously determined 24-hour values.

To estimate a 3-hour heat input rate multiply the corresponding 24-hour value (10^6 Btu/24-hours) by the ratio of the respective 3-hour to the 24-hour megawatt outputs.

(5) Requirements for Calculating Combined SO_2 Emissions:

(i) 3-hour averaging period: The combined emission rates from the operating boilers are equal to the sum of the products of the individual heat input rates (10^6 Btu/3-hours) and the SO_2 emission rates (lb/10^6 Btu as determined for the 3-hour period). This quantity, when divided by 2000 lb/ton, equals the combined tons of 3-hour SO_2 emissions (see Equation 1).

$$M_j = \sum_{i=1}^{n} \frac{E_{ij} H_{ij}}{2000} \qquad \text{Equation 1}$$

Where:

M_j = combined (e.g., Units Nos. 1 and 2 or Units Nos. 1, 2, and 3) emission rates for the operating units in tons SO_2, for the jth averaging period (3-hour or 24-hour).

E_{ij} = average emission rates from the "ith" unit in lb SO_2, for the jth average period where j = 3-hour or 24-hour.

H_{ij} = average heat input rates for the "ith" unit in 10^6 Btu per "jth" averaging period where j = 3-hour or 24-hour.

n = number of operating units.

NOTE.—Equation 1 is to be used for calculating: (1) combined tons of SO_2 emissions from Units Nos. 1 and 2 and (2) combined tons of SO_2 emissions from Units Nos. 1, 2, and 3. Equation 1 is applicable to both 3-hour and 24-hour averaging periods. Furthermore, if a unit is not combusting fuel, "H_{ij}" will be zero.

(ii) 24-hour averaging period:

(A) The combined emissions from the operating boilers is equal to the sum of the products of the individual heat inputs (10^6 Btu/24-hour) and the SO_2 emissions (lb/10^6 Btu as determined for the 24-hour period). This quantity, when divided by 2000 lb/ton, equals the combined tons of 24-hour SO_2 emissions (see Equation 1).

(B) The combined emissions from the operating boilers, in the units lb/10^6 Btu, is equal to the sum of the products of the individual heat inputs (10^6 Btu/24-hour) and the SO_2 emissions (lb/10^6 Btu as determined for the 24-hour period) divided by the sum of the combined heat inputs (see Equation 2).

$$E = \sum_{i=1}^{n} \frac{(E_i H_i)}{H_i} \qquad \text{Equation 2}$$

Where:

E = combined emission rates for the operating units in lb SO_2/10^6 Btu, for the 24-hour averaging period.

E_i = 24-hour average emission rates from the "ith" unit in lb SO_2/10^6 Btu.

H_i = 24-hour average heat input rates for the "ith" unit in 10^6 Btu/24-hour.

n = number of operating units.

NOTE.—If a unit is not combusting fuel, "H_i" will be zero.

(iii) 30-day rolling average: Once *every* day, calculate combined 30-calendar day emission average rates (beginning 60 days after the effective date of this waiver), using all available combined 24-hour emission rate averages [paragraph (g)(5)(ii)(B) of this section], for the *most recent* 30 consecutive calendar days. To make the two calculations for the combined (Units Nos. 1, 2, and 3; Units Nos. 1 and 2) emission rates, add the 30 consecutive daily combined average emission rates (lb SO_2/10^6 Btu) and divide the sum by 30 days.

(6) Quality Assurance (QA) Requirements: The Company shall validate the required emission data by performing at least the quality assurance procedures specified herein. These QA requirements are considered the minimum necessary to ensure that the sampling methods employed produce valid data. The performance criteria that are established in this section and that are restated in Table 1 are considered both necessary and reasonably achievable. If, for any reason, a CEMS system fails to achieve the required specifications, the CEMS shall be immediately taken out of service and sampling with a CB system shall be initiated. If, for any reason, a CB (which is being used while a CEMS is out of service) fails to meet the re-

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quired specifications, the Company shall notify the Director of the Division of Stationary Source Enforcement (Washington, D.C.) within 72 hours, as per paragraph (g)(8)(iv) of this section. The Company is encouraged to supplement these procedures to improve the quality of the emission data obtained.

(i) QA requirements, calculation procedures, and specification limits for CEMS: At a minimum, the Company shall conduct the following initial, daily, weekly, and quarterly QA evaluations of each boiler's CEMS data. Where designated, the response time and calibration error test procedures contained in Reference 2 and the remaining performance test procedures, including those for relative accuracy, of the January 26, 1981 proposed Performance Specifications 2 and 3 (Ref. 1) shall be used.

(A) Daily zero and calibration checks of the CEMS. Conduct the following zero and calibration drift checks of each CEMS at approximately 24-hour intervals, and use the equations provided here to determine if the CEMS meets the designated drift specifications. All monitors that have exhibited drift during the previous 24-hour period must be adjusted immediately after the drift checks have been performed and the results have been recorded.

(*1*) 24-hour *zero* drift of the SO_2 monitor (this test is to be performed using low range (2-5%) span gas):

Specification limits: 8.0% of span in any 24-hour period; 2.0% of span for any three consecutive 24-hour periods.

$$\text{24-hour } SO_2 \text{ zero drift} = \frac{CEMS_z - G_z}{CEMS_s} \times 100 \qquad \text{Equation 3}$$

where:

$CEMS_z$ = monitor zero value (ppm)

G_z = zero gas value (ppm)

$CEMS_s$ = monitor span value (ppm)

(*2*) 24-hour *zero* drift of the O_2 monitor:

Specification limits: 2.0% O_2 in any 24-hour period; 0.5% O_2 for any three consecutive 24-hour periods.

$$\text{24-hour } O_2 \text{ zero drift} = \left| CEMS_z - G_z \right| \times 100 \qquad \text{Equation 4}$$

where:

$CEMS_z$ = monitor zero value ($\%O_2$)

G_z = zero gas value ($\%O_2$)

(*3*) 24-hour *calibration* drift of the SO_2 monitor (this test is to be performed using 85-95% span gas):

Specification limits: 10.0% of span in any one 24-hour period; 2.5% of span for any three consecutive 24-hour periods.

$$\text{24-hour } SO_2 \text{ calibration drift} = \left| \frac{CEMS_r - G_v}{CEM_s} \right| \times 100 \qquad \text{Equation 5}$$

where:
$CEMS_r$ = monitor reading (ppm)
G_v = calibration gas value (ppm)
$CEMS_s$ = monitor span value (ppm)

(*4*) 24-hour *calibration* drift of the O_2 monitor:

Specification limits: 2.0% O_2 in any one 24-hour period; 0.5% O_2 for any three consecutive 24-hour periods.

$$\text{24-hour } O_2 \text{ calibration drift} = \left| CEMS_r - G_v \right| \times 100 \qquad \text{Equation 6}$$

where:
$CEMS_r$ = monitor reading (%O_2)
G_v = calbration gas value (%O_2)

(B) Daily mid-range checks of the CEMS.—Conduct the following mid-range calibration checks of each CEMS *after* performing the zero and calibration drift checks. The purpose for requiring mid-range calibration checks is to verify CEMS linearity between the zero and calibration values. The mid-range calibration checks shall be conducted at approximately 24-hour intervals (or more frequently), and the equations provided shall be used to determine if the CEMS meets the designated specification limits:

24-hour *mid-range* drift check of the SO_2 *and* the O_2 monitors (this test is to be performed using 45-55% span gas): Specification limits (same for SO_2 and O_2 monitors): 10% of mid-range gas in any one 24-hour period and 5.0% of mid-range gas in any three consecutive 24-hour periods.

$$SO_2 \text{ and } O_2 \text{ mid-range drift} = \left| \frac{CEMS_r}{G_v} - 1 \right| \times 100 \qquad \text{Equation 7}$$

where:
$CEMS_r$ = monitor reading (ppm SO_2 or %O_2)
G_v = mid-range gas value (ppm SO_2 or %O_2)

(C) Initial and weekly checks of the CEMS.—Initially and once each week, conduct at least one 24-hour modified relative accuracy test of each CEMS (combined SO_2 and O_2 channels in units of SO_2 lb/10^6 Btu) using the CB method. If the difference between the CEMS and CB exceeds the designated specification limit, the 24-hour test must be repeated, within the next 24-hour period. If the CEMS again fails to meet the specification limit, remove the monitor from service.

Specification limit: ±20% (maximum percent difference between CEMS and CB)

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$$\text{24-hour percent difference (CEM } vs. \text{ CB)} \left| \frac{\text{CEMS}}{\text{CB}} - 1 \right| \times 100 \qquad \text{Equation 8}$$

where:

CEMS = SO_2/O_2 monitor system reading (SO_2 lb/10^6 Btu)
CB = CB measurement results (SO_2 lb/10^6 Btu)

(D) Initial and quarterly performance specification tests of CEMS. Initially and once each three months, conduct at least one 3-hour relative accuracy test (combined SO_2 and O_2 channels as per Reference 1), and a response time and calibration error test, (as per Reference 2). The calculation procedures provided in References 1 and 2 shall also be used.

Specification limits: ● Relative Accuracy = ±20% (maximum percent difference between the CEMS and the RM data in units of lb $SO_2/10^6$ Btu)

- Response Time = 15 minutes
- Calibration Error = 5.0% (SO_2 and O_2 channels separately)

(E) Unscheduled performance specification tests of the CEMS.—If for any reason (other than routine maintenance as specified in the Lear Siegler operating manual) the CEMS is taken out of service or its performance is not within the specification limits of paragraph (g)(6) of this section, the Company shall conduct a complete Performance Specification Test (PST) of the CEMS, according to the combined requirements of References 1 and 2, as per paragraph (g)(6)(i)(D) of this section. Whenever a CEMS is taken out of service and a supplementary CB system is being used, the CEMS shall not replace the CB system until such time that the Company has demonstrated that the performance of the CEMS is within all of the performance limits established by paragraphs (g)(6)(i)(A), (B), (C), and (D) of this section.

(ii) QA requirements, calculation procedures, and specification limits for CB systems: At a minimum, the Company shall conduct the following initial, weekly, and quarterly QA evaluations of *all* CB systems that are being used: (1) For any quality assurance evaluations of a CEMS; and (2) as the secondary compliance method when a CEMS is out of service. If a CB system does not meet these specifications, then: (1) The CB must immediately be taken out of service; (2) the Company must notify the Director, Division of Stationary Source Enforcement (Washington, D.C.) within 72 hours after this determination is made; and (3) the Company will be considered in violation of the provisions of the waiver until an acceptable monitoring method is initiated (see paragraph (g)(8)(iii) of this section).

(A) Initial and weekly mid-range calibration checks of the CB system.—Calibration checks of the CB system, using mixed SO_2/CO_2 mid-range calibration gas, shall be performed initially and at least once each week thereafter. The calibration gas shall be sampled by the CB system for no less than 2 hours at a flow rate approximately the same as used during emission sampling. The following equation shall be used to determine if the CB meets the designated mid-range calibration specification limit.

Specification limit: 10.0% (maximum percent difference between CB value and mid-range gas value).

$$\text{Percent difference (CB vs. calibration gas)} = \left| \frac{\text{CB}}{C_v} - 1 \right| \times 100 \qquad \text{Equation 9}$$

where:
CB = bubbler value (SO_2 lb/10^6 Btu)
G_v = mixed SO_2/CO_2 mid-range calibration gas value (SO_2 lb/10^6 Btu)

(B) Initial and quarterly relative accuracy tests of the CB systems. Operate at least one of the CB systems used during the quarter for a 3-hour period. During the same three hour period, collect at least one paired set of Reference Method 3 and 6 samples. Each paired set shall consist of at least three to six 20-60 minute consecutive ("back-to-back") runs. The following equation shall be used to determine if the CB meets the designated relative accuracy specifications limit.

CB Specification limit: 10.0% (maximum percent difference between CB value and and RM value).

$$\text{Percent difference (CB vs. RM)} \quad \left| \frac{CB}{RM} - 1 \right| \times 100 \qquad \text{Equation 10}$$

where:
CB = bubbler value (SO_2 lb/10^6 Btu)
RM = average value of the paired Reference Method 3 and 6 runs (SO_2 lb/10^6 Btu)

(iii) QA requirements and specification limit for calibration gases: All calibration gases used for daily, weekly, or quarterly calibration drift checks, CB calibration checks and performance specification tests shall be analyzed following EPA Traceability Protocol No. 1 (see reference 4) or with Method 3 or 6. If Method 3 or 6 is used, do the following. Within two weeks prior to its use on a CEMS, perform triplicate analyses of the cylinder gas with the applicable reference method until the results of three consecutive individual runs agree within 10 percent of the average. Then use this average for the cylinder gas concentration.

(iv) Quality assuance checks for laboratory analysis: Each day that the Company conducts Reference Method 6 or CB laboratory analyses, at least two SO_2 audit samples shall be analyzed concurrently, by the same personnel, and in the same manner as the Company uses when analyzing its daily emission samples. Audit samples must be obtained from EPA. The following equation shall be used to calculate the designated specification limit to determine if the Company's laboratory analysis procedures are adequate.

Analysis specification limit (for each of two audit samples): 5% (maximum percent difference between laboratory value and the average of the actual value of the audit samples).

$$\text{Percent difference (laboratory } \textit{vs.} \text{ actual)} = \left| \frac{SLV}{SAV} - 1 \right| \times 100 \qquad \text{Equation 11}$$

where:
SLV = *laboratory* value (mg/DSCM) of the audit sample
SAV = *actual* value (mg/DSCM) of the audit sample

(v) QA requirements, calculation procedures, and specification limits for 24-hour fuel sampling and analysis: At a minimum, the Company shall conduct the following bi-weekly QA evaluations of each boiler's fuel sampling and analysis data.

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(A) Initially and at least bi-weekly the Company (or its own contractor laboratory) shall prepare and split a 60 mesh (250 micron) sample of coal (24-hour composite) with an independent laboratory. The Company shall compare the independent laboratory's heat content values to those of the Company's respective analyses. Use the following equation to determine if the Company's coal analysis procedures are adequate.

Specification limit: 500 Btu/lb (maximum difference between the two laboratories' results)

Specification limit: 500 Btu/lb (maximum difference between the two laboratories' results)

$$\text{Inter-laboratory difference} = |\text{CFA} - \text{IFA}| \qquad \text{Equation 12}$$

where:
CFA = Company's fuel analysis (Btu/lb)
IFA = Independent laboratory anlysis (Btu/lb)

(B) Analysis of reference coal.—At a minimum, the Company shall initially (and thereafter bi-weekly), but on alternating weeks from above (g)(6)(v)(A) of this section analysis, analyze the heat content of at least one reference coal sample. Reference coal samples must be obtained from EPA. Use the following equation to determine if the Company's fuel analysis procedures are adequate.

Specification limit: 500 Btu/lb (maximum difference between the Company laboratory's value and the heat content of the reference coal).

$$\text{Difference between Company's laboratory and reference} = |\text{FAV} - \text{FLV}| \qquad \text{Equation 13}$$

where:
FLV = laboratory value (Btu/lb)
FAV = reference value (Btu/lb)

(vi) The use of more than the minimum quantities of data to calculate the QA specifications: Whenever the Company supplements, expands, or otherwise obtains more than the minimum amount of QA data required by paragraph (g)(6) of this section for the QA evaluations, the Company shall use all available data in assessing achievement of the QA specifications. All of the equations delineated above may be expanded algebraically to accommodate increased data, sample runs, or test repetitions.

(7) Compliance Provisions:

(i) Compliance with all of the provisions of this waiver requires:

(A) Documentation that the combined emission levels (of Units Nos. 1, 2, and 3 or 1 and 2, as appropriate) did not exceed the emission limitations specified in paragraph (e) of this section.

(B) Documentation that the Company acquired at least the minimum quantity and quality of valid emission data specified in paragraph (g)(3) of this section.

(C) Documentation that the Company performed at least the minimum quality assurance checks specified in paragraph (g)(6) of this waiver; and

(D) Timely and adequate reporting of all data specified in paragraph (g)(8) of this section.

Failure to meet any of these requirements constitutes a violation of this waiver.

(ii) SO_2 emissions rate data from individual boilers shall be obtained by the primary compliance test method (CEMS), by the secondary compliance

test method (CB), or other methods approved by the Administrator. Data for the heat input determination shall be obtained by 24-hour as-fired fuel analysis and 24-hour coal feed rate measurements, or other methods approved by the Administrator. Compliance with all SO_2 emission limitations shall be determined in accordance with the calculation procedures set forth in paragraph (g)(5) of this section or other procedures approved by the Administrator. The Company must demonstrate compliance with all 3-hour, 24-hour, and 30-day SO_2 emission limitations during all periods of fuel combustion in one or more boilers (beginning with the effective date of the waiver), and including all periods of process start-up, shutdown, and malfunction.

(iii) If the minimum quantity or quality of emission data (required by paragraph (g) of this section) were not obtained, compliance of the affected facility with the emission requirements specified in this waiver may be determined by the Administrator using all available data which is deemed relevant.

(iv) For the purpose of demonstrating compliance with the emission limitations and data requirements of this waiver:

(A) "A day" (24-hour period) begins at 12:01 p.m. and ends at 12:00 noon the following day. The Company may select an alternate designation for the beginning and end of the 24-hour day. However, the Agency must be notified of any alternate designation of a "day" and must be maintained throughout the waiver period. Also, for the purpose of reporting, each day shall be designated by the calendar date corresponding with the beginning of the 24-hour period;

(B) Where concurrent 24-hour data averages are required (i.e., coal feed rate, fuel sampling/analysis, SO_2 tons/24 hours, and SO_2 lb/10^6 Btu), the designated 24-hour period comprising a day shall be consistent for all such averages and measurement data; and

(C) There are eight discrete 3-hour averaging periods during each day.

(8) Notification and Reporting Requirements.

(i) Notification: The Company shall provide at least 30 days notice to the Director, Division of Stationary Source Enforcement (Washington, D.C.) of any forthcoming quarterly CEMS Performance Specification Tests and CB accuracy tests.

(ii) Quarterly Compliance and Monitoring Assessment Report requirements: The Company shall submit to the Director, Division of Stationary Source Enforcement (Washington, D.C.) "hard copy" quarterly reports that present compliance data and relevant monitoring and process data (e.g., process output rate, heat input rate, monitoring performance, and quality assurance) acquired during the reporting period. Quarterly reports shall be postmarked no later than 30 days after the completion of every (whole or partial) calendar quarter during which the waiver is in effect.

NOTE: These requirements do not replace or preclude the "Unscheduled Reporting Requirements" contained in paragraph (g)(8)(iii) of this section.

The following specific information shall be furnished for every calendar day:

(A) General Information:

(*1*) Calendar date;

(*2*) The method(s), including description, used to determine the 24-hour heat input to each boiler (in units of Btu/hour);

(*3*) The "F" factor(s) used for all applicable calculations, the method of its determination, and the type of fuel burned;

(B) Emission Data:

(*1*) Combined (Units Nos. 1, 2, and 3) 24-hour average SO_2 emission rate (in units of lb/MMBtu);

(*2*) Combined (Units Nos. 1, 2 and 3) rolling 30-day average SO_2 emission rate (in units of lb/MMBtu);

(*3*) Combined (Units Nos. 1, 2, and 3) 3-hour average emission rates (in units of tons SO_2);

(*4*) Combined (Units Nos. 1, 2, and 3) 24-hour average emission rates (in units of tons SO_2);

(*5*) Combined (Units Nos. 1 and 2) 3-hour average emission rates (in units of tons SO_2); and

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(6) Combined (Units Nos. 1 and 2) 24-hour average emission rates (in units of tons SO_2).

(C) Quality Assurance Check Data:

(1) The date and summary of results from all (initial and repetitions) of the quality assurance checks performed during the quarter. This includes all analytical results on EPA's SO_2 and coal audit samples.

(2) Description(s) of any modification(s) made to the CEMS or CB which could affect the ability of those systems to comply with the performance specifications in References 1 and 2, or the CB performance specifications established by Section (g) of this waiver.

(D) Atypical Operations:

(1) Identification of specific periods during the calendar quarter when each boiler was not combusting fuel;

(2) Periods of time when 3-hour, 24-hour, and/or 30-day averages were obtained using continuous bubbler data;

(3) All emission averages which have been calculated using a composite of two or more different sampling methods (i.e., periods when both CEMS and CB systems have been used) must be identified by designating all duration(s) and cause(s) of data loss during such periods;

(4) For each instance when a CEMS has been out of service, the Company shall designate:

(i) Time, date, duration;

(ii) Reason for such downtime;

(iii) Corrective action taken;

(iv) Duration before CB sampling began;

(v) Time, date, and performance specification test (summary) results acquired before CEMS returned to service; and

(vi) Time and date when CEMS actually returned to service, relative to terminating CB sampling.

(5) Where only a portion of continuous data from any averaging period(s) was obtained, the duration per averaging period(s) when data were acquired and were used to calculate the emission average(s) must be identified;

(6) If the required quantity or quality of emission data (as per paragraph (g) of this section) were not obtained for any averaging period(s), the following information must also be reported for each affected boiler. (See also Unscheduled Reporting Requirements, paragraph (g)(7)(iv) of this section:

(i) Reason for failure to acquire sufficient data;

(ii) Corrective action taken;

(iv) Characteristics (percent sulfur, ash content, heating value, and moisture) of the fuel burned;

(v) Fuel feed rates and steam production rates;

(vi) All emission and quality assurance data available from this quarter; and

(vii) Statement (signed by a responsible Company official) indicating if any changes were made in the operation of the boiler or any measurement change (±20 percent) from the previous averaging period) in the type of fuel or firing rate during such period.

(E) Company Certifications: The Company shall submit a statement (signed by a responsible Company official) indicating:

(1) Whether or not the QA requirements of this waiver for the CEMs, CB, and fuel sampling/analysis methods, or other periodic audits, have been performed in accordance with the provisions of this waiver;

(2) Whether or not the data used to determine compliance was obtained in accordance with the method and procedures required by this waiver, including the results of the quality assurance checks;

(3) Whether or not the data requirements have been met or, if the minimum data requirements have not been met due to errors that were unavoidable (attach explanation);

(4) Whether or not compliance with all of the emission standards established by this waiver have been achieved during the reporting period.

(iii) Unscheduled Reporting Requirements. The Company shall submit to the Director, Division of Stationary Source Enforcement (Washington, D.C.).

(A) Complete results of all CEMS performance specification tests within 45 days after the initiation of such tests;

(B) The Company shall report, within 72 hours, each instance of:

(*1*) Failure to maintain the combined (Units Nos. 1, 2, and 3 and Units Nos. 1 and 2, respectively) SO_2 emission rates below the emission limitations prescribed in Section (e) of this waiver;

(*2*) Failure to acquire the specified minimum quantity of valid emission data; and

(*3*) Failure of the Company's CB(s) to meet the quality assurance checks.

REFERENCES

1. Standards of Performance for New Stationary Sources; Revisions to General Provisions and Additions to Appendix A, and Reproposal of Revisions to Appendix B, 46 FR 8352 (January 26, 1981).

2. Proposed Standards of Performance for New Stationary Sources; Continuous Monitoring Performance Specifications 44 FR 58602 (October 10, 1979).

3. 40 CFR Part 60, Appendix A (July 1, 1979).

4. *Quality Assurance Handbook for Air Pollution Measurement Systems,* Volume III, Stationary Source Specific Methods. EPA-600/4-77-027b, August 1977.

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TABLE 1.—REQUIRED PERFORMANCE CRITERIA FOR QUALITY ASSURANCE (QA) EVALUATIONS

Sampling method	Minimum frequency	QA check	Specification limit	Duration	Calculation procedures
CEMS	Daily	24-hour zero drift SO_2	2.0 percent span	3 consecutive days.	Equation 4.
CEMS	Daily	24-hour zero drift SO_2	8.0 percent span	24 hours	Equation 4.
CEMS	Daily	24-hour calibration drift SO_2	2.5 percent span	3 consecutive days.	Equation 5.
CEMS	Daily	24-hour calibration drift SO_2	10.0 percent span	24 hours	Equation 5.
CEMS	Daily	24-hour zero drift O_2	0.5 percent O_2	3 consecutive days.	Equation 6.
CEMS	Daily	24-hour zero drift O_2	2.0 percent O_2	24 hours	Equation 6.
CEMS	Daily	24-hour calibration drift O_2	0.5 percent O_2	3 consecutive days.	Equation 7.
CEMS	Daily	24-hour calibration drift O_2	2.0 percent O_2	24 hours	Equation 7.
CEMS	Daily	24-hour mid-range check (SO_2 or NO_x)	5.0 percent calibration gas value	3 consecutive days.	Equation 8.
CEMS	Daily	24-hour mid-range check (SO_2 or NO_x)	10.0 percent calibration gas value	24 hours	Equation 8.
CEMS [1]	Weekly [1]	Modified relative accuracy [1]	20.0 percent difference [1]	24 hours [1]	Equation 9. [1]
CEMS	Initial and quarterly.	Relative accuracy (SO_2/O_2 combined)	20.0 percent difference	9–12 hours	See Reference 1.
CEMS	Initial and quarterly.	Calibration error	50.0 percent calibration gas value	(N/A)	See Reference 2.
CEMS	Initial and quarterly.	Response time	15 minutes	(N/A)	See Reference 2.
CEMS	Initial and quarterly.	24-hour calibration drift (SO_2 and O_2 or CO_2)	2.5 percent span	7 consecutive days.	See Reference 1.
CB	Initial and weekly	Mid-range check (SO_2/CO_2)	10.0 percent calibration gas value	(N/A)	Equation 10.
CB	Initial and quarterly.	Relative accuracy (SO_2/CO_2 combined)	10.0 percent difference	3 hours	Equation 11.
Fuel S&A	Initial and bi-weekly.	Split sample analysis	500 Btu/hr difference	(N/A)	Equation 13.
Fuel S&A	Initial and bi-weekly.	Reference coal analysis	500 Btu/hr difference	(N/A)	Equation 14.
Laboratory analysis.	Daily	Method 6 audit sample analysis	5.0 percent difference	(N/A)	Equation 12.

[1] Failure to meet this specification requires the test to be repeated one time. If this test documents a second failure to CEMS must be taken out of service.

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APPENDIX I—DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM FOSSIL FUEL FIRED COMBUSTION SOURCES (CONTINUOUS BUBBLER METHOD)

[NOTE: The Company may use the method or its modifications which it requested and which are restated in Section (g)(2)(ii)(A) during the waiver period.]

1. *Applicability and Principle.*

1.1 Applicability. This method applies to the determination of sulfur dioxide (SO_2) emissions from combustion sources in terms of emission rate ng/J (lb/MMBtu).

1.2. Principle. A gas sample is extracted from the sampling point (in the emission exhaust duct or stack) over a 24-hour or other specified time period. The SO_2 and CO_2 contained in the sampled exhaust gases are separated and collected in the sampling train. The SO_2 fraction is measured by the barium-thorium titration method and CO_2 is determined gravimetrically.

2. *Apparatus.*

2.1 Sampling. The sampling train is shown in Figure 1; the equipment required is the same as for Method 6, except as specified below:

2.1.1 Impingers. Three 150 ml. Mae West impingers with a 1-mm restricted tip.

2.1.2 Absorption Tubes. Two 51 mm x 178 mm glass tubes with matching one-hole stoppers.

2.2 Sample Recovery and Analysis. The equipment needed for sample recovery and analysis is the same as required for Method 6. In addition, a balance to measure (within 0.05g) is needed for analysis.

3. *Reagents.*

Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society. Where such specifications are not available, use the best available grade.

3.1. Sampling. The reagents required for sampling are the same as specified in Method 6, except that 10 percent hydrogen peroxide is used. In addition, the following reagents are required:

3.1.1 Drierite. Anhydrous calcium sulfate ($CaSO_4$) dessicant, 8 mesh.

3.1.2 Ascarite. Sodium hydroxide coated asbestos for absorption of CO_2, 8 to 20 mesh.

3.2 Sample Recovery and Analysis. The reagents needed for sample recovery and analysis are the same as for Method 6, Sections 3.2 and 3.3, respectively.

4. *Preparation of Collection Train.* Measure 75 ml. of 80 percent IPA into the first impinger and 75 ml. of 10 percent hydrogen peroxide into each of the remaining impingers. Into one of the absorption tubes place a one-hole stopper and glass wool plug in the end and add 150 to 200 grams of drierite to the tube. As the drierite is added shake the tube to evenly pack the absorbent. Cap the tube with another plug of glass wool and a one-hold stopper (use this end as the inlet for even flow). The ascarite tube is filled in a similar manner, using 150-175 grams of ascarite. Clean and dry the outside of the ascarite tube and weigh (at room temperatue, 20 degrees C) to the nearest 0.1 gram. Record this initial mass as M_{ai}. Assemble the train as shown in Figure 1. Adjust the probe heater to a temperature sufficient to prevent water condensation.

4.1.1 Sampling. The bubbler shall be operated continuously at a sampling rate sufficient to collect 70-80 liters of source effluent during the desired sampling period. For example, a sampling rate of 0.05 liter/min. is sufficient for a 24-hour average and 0.40 liter per minute for a 3-hour average. The sampling rate shall not, however, exceed 1.0 liter/min.

4.2 Sample Recovery.

4.2.1 Peroxide Solution. Pour the contents of the second and third impingers into a leak-free polyethylene bottle for storage or shipping. Rinse the two impingers and connecting tubing with deionized distilled water, and add the washings to the same storage container.

4.2.2 Ascarite Tube. Allow the ascarite tube to equilibrate with room temperature (about 10 minutes), clean and dry the outside, and weigh to the nearest 0.1g in the same manner as in Section 4.1.1. Record this final mass (M_{af}) and discard the used ascarite.

4.3 Sample Analysis. The sample analysis procedure for SO_2 is the same as specified in Method 6, Section 4.3.

5. *Calculations.*

5.1 SO_2 mass collected.

$$M_{so2} = 32.03\ (V_t - V_{tb})\ N\ V_{soln} V_a$$

Equation A1-1

Where:

M_{so2} = mass of SO_2 collected, mg

V_t = volume of barium perchlorate titrant used for the sample, ml (average of replicate titrations).

V_{tb} = volume of barium perchlorate titrant used for the blank, ml.

N = normality of barium perchlorate titrant, milliequivalents/ml.

V_{soln} = total volume of solution in which the sulfur dioxide sample is contained, ml.

V_a = volume of sample aliquot titrated, ml.

5.2 Sulfur dioxide emission rate

$$E_{so2} = F_c\ (K_2)[M_{so2}/(M_{af} - M_{ai})]$$

Equation A1-2

Where:

M_{ai} = initial mass of ascarite, grams.

M_{af} = final mass of ascarite, grams.

E_{so2} = Emission rate of SO_2, ng/J (lb/MMBtu).

F_c = Carbon F factor for the fuel burned, M^3/J, from Method 19 (Ref. 2)

$K^2 = 1.829 \times 10^9$

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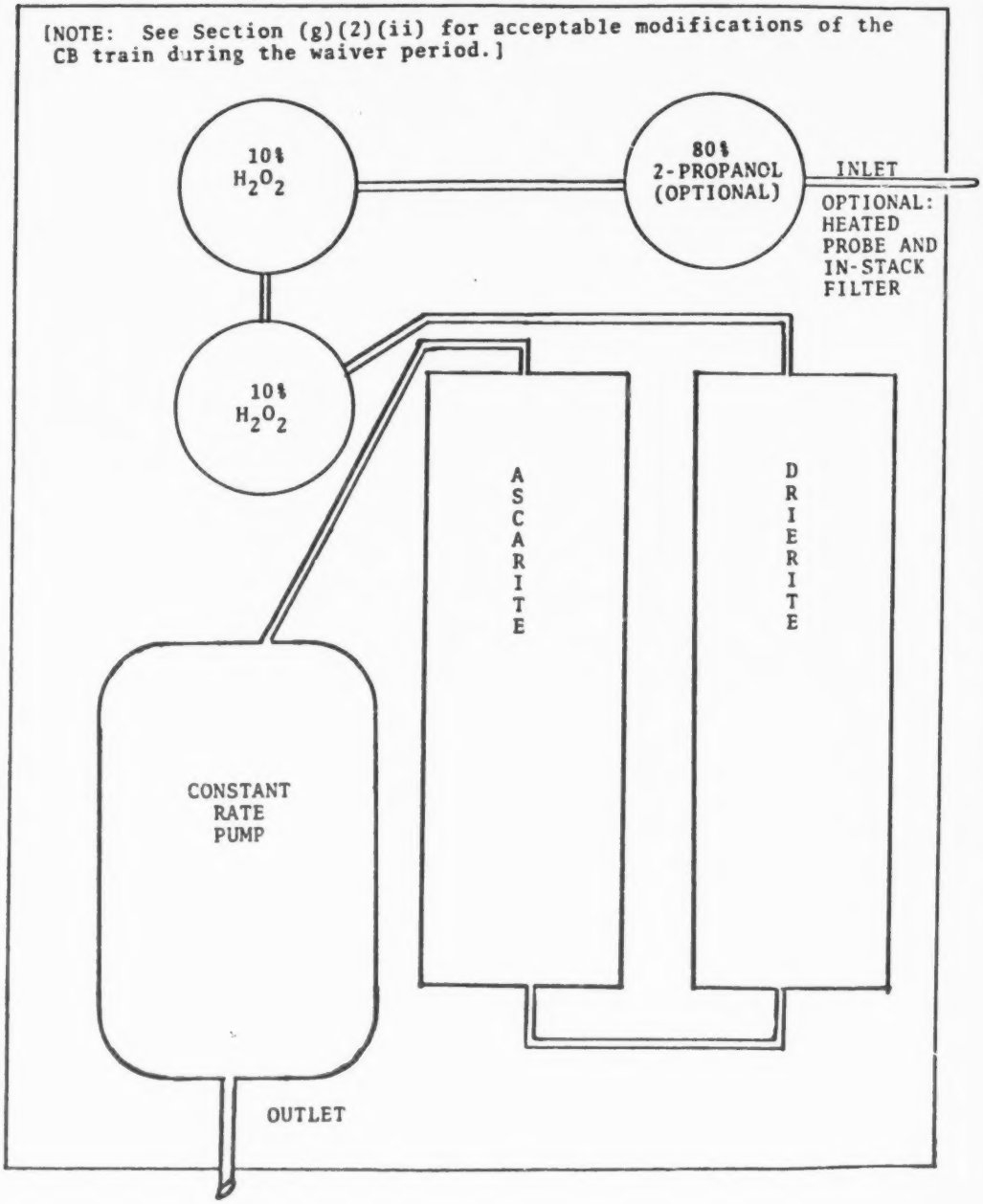
FIGURE 1

CONTINOUOUS BUBBLER (SO_2/CO_2) SAMPLING TRAIN



[46 FR 55980, Nov. 13, 1981]

Subpart Da—Standards of Performance for Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978

AUTHORITY: Sec. 111, 301(a) of the Clean Air Act as amended (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

SOURCE: 44 FR 33613, June 11, 1979, unless otherwise noted.

§ 60.40a Applicability and designation of affected facility.

(a) The affected facility to which this subpart applies is each electric utility steam generating unit:

(1) That is capable of combusting more than 73 megawatts (250 million Btu/hour) heat input of fossil fuel (either alone or in combination with any other fuel); and

(2) For which construction or modification is commenced after September 18, 1978.

(b) This subpart applies to electric utility combined cycle gas turbines that are capable of combusting more than 73 megawatts (250 million Btu/hour) heat input of fossil fuel in the steam generator. Only emissions resulting from combustion of fuels in the steam generating unit are subject to this subpart. (The gas turbine emissions are subject to Subpart GG.)

(c) Any change to an existing fossil-fuel-fired steam generating unit to accommodate the use of combustible materials, other than fossil fuels, shall not bring that unit under the applicability of this subpart.

(d) Any change to an existing steam generating unit originally designed to fire gaseous or liquid fossil fuels, to accommodate the use of any other fuel (fossil or nonfossil) shall not bring that unit under the applicability of this subpart.

§ 60.41a Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

"Steam generating unit" means any furnace, boiler, or other device used for combusting fuel for the purpose of producing steam (including fossil-fuel-fired steam generators associated with combined cycle gas turbines; nuclear steam generators are not included).

"Electric utility steam generating unit" means any steam electric generating unit that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MW electrical output to any utility power distribution system for sale. Any steam supplied to a steam distribution system for the purpose of providing steam to a steam-electric generator that would produce electrical energy for sale is also considered in determining the electrical energy output capacity of the affected facility.

"Fossil fuel" means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such material for the purpose of creating useful heat.

"Subbituminous coal" means coal that is classified as subbituminous A, B, or C according to the American Society of Testing and Materials' (ASTM) Standard Specification for Classification of Coals by Rank D388-66.

"Lignite" means coal that is classified as lignite A or B according to the American Society of Testing and Materials' (ASTM) Standard Specification for Classification of Coals by Rank D388-66.

"Coal refuse" means waste products of coal mining, physical coal cleaning, and coal preparation operations (e.g. culm, gob, etc.) containing coal, matrix material, clay, and other organic and inorganic material.

"Potential combustion concentration" means the theoretical emissions (ng/J, lb/million Btu heat input) that would result from combustion of a fuel in an uncleaned state 9without emission control systems) and:

(a) For particulate matter is:

(1) 3,000 ng/J (7.0 lb/million Btu) heat input for solid fuel; and

(2) 75 ng/J (0.17 lb/million Btu) heat input for liquid fuels.

(b) For sulfur dioxide is determined under § 60.48a(b).

(c) For nitrogen oxides is:

(1) 290 ng/J (0.67 lb/million Btu) heat input for gaseous fuels;

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(2) 310 ng/J (0.72 lb/million Btu) heat input for liquid fuels; and

(3) 990 ng/J (2.30 lb/million Btu) heat input for solid fuels.

"Combined cycle gas turbine" means a stationary turbine combustion system where heat from the turbine exhaust gases is recovered by a steam generating unit.

"Interconnected" means that two or more electric generating units are electrically tied together by a network of power transmission lines, and other power transmission equipment.

"Electric utility company" means the largest interconnected organization, business, or governmental entity that generates electric power for sale (e.g., a holding company with operating subsidiary companies).

"Principal company" means the electric utility company or companies which own the affected facility.

"Neighboring company" means any one of those electric utility companies with one or more electric power interconnections to the principal company and which have geographically adjoining service areas.

"Net system capacity" means the sum of the net electric generating capability (not necessarily equal to rated capacity) of all electric generating equipment owned by an electric utility company (including steam generating units, internal combustion engines, gas turbines, nuclear units, hydroelectric units, and all other electric generating equipment) plus firm contractual purchases that are interconnected to the affected facility that has the malfunctioning flue gas desulfurization system. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional entitlement to electric output is otherwise established by contractual arrangement.

"System load" means the entire electric demand of an electric utility company's service area interconnected with the affected facility that has the malfunctioning flue gas desulfurization system plus firm contractual sales to other electric utility companies. Sales to other electric utility companies (e.g., emergency power) not on a firm contractual basis may also be included in the system load when no available system capacity exists in the electric utility company to which the power is supplied for sale.

"System emergency reserves" means an amount of electric generating capacity equivalent to the rated capacity of the single largest electric generating unit in the electric utility company (including steam generating units, internal combustion engines, gas turbines, nuclear units, hydroelectric units, and all other electric generating equipment) which is interconnected with the affected facility that has the malfunctioning flue gas desulfurization system. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional entitlement to electric output is otherwise established by contractual arrangement.

"Available system capacity" means the capacity determined by subtracting the system load and the system emergency reserves from the net system capacity.

"Spinning reserve" means the sum of the unutilized net generating capability of all units of the electric utility company that are synchronized to the power distribution system and that are capable of immediately accepting additional load. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional entitlement to electric output is otherwise established by contractual arrangement.

"Available purchase power" means the lesser of the following:

(a) The sum of available system capacity in all neighboring companies.

(b) The sum of the rated capacities of the power interconnection devices between the principal company and all neighboring companies, minus the sum of the electric power load on these interconnections.

(c) The rated capacity of the power transmission lines between the power interconnection devices and the electric generating units (the unit in the principal company that has the malfunctioning flue gas desulfurization system and the unit(s) in the neighboring company supplying replacement electrical power) less the electric

power load on these transmission lines.

"Spare flue gas desulfurization system module" means a separate system of sulfur dioxide emission control equipment capable of treating an amount of flue gas equal to the total amount of flue gas generated by an affected facility when operated at maximum capacity divided by the total number of nonspare flue gas desulfurization modules in the system.

"Emergency condition" means that period of time when:

(a) The electric generation output of an affected facility with a malfunctioning flue gas desulfurization system cannot be reduced or electrical output must be increased because:

(1) All available system capacity in the principal company interconnected with the affected facility is being operated, and

(2) All available purchase power interconnected with the affected facility is being obtained, or

(b) The electric generation demand is being shifted as quickly as possible from an affected facility with a malfunctioning flue gas desulfurization system to one or more electrical generating units held in reserve by the principal company or by a neighboring company, or

(c) An affected facility with a malfunctioning flue gas desulfurization system becomes the only available unit to maintain a part or all of the principal company's system emergency reserves and the unit is operated in spinning reserve at the lowest practical electric generation load consistent with not causing significant physical damage to the unit. If the unit is operated at a higher load to meet load demand, an emergency condition would not exist unless the conditions under (a) of this definition apply.

"Electric utility combined cycle gas turbine" means any combined cycle gas turbine used for electric generation that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MW electrical output to any utility power distribution system for sale. Any steam distribution system that is constructed for the purpose of providing steam to a steam electric generator that would produce electrical power for sale is also considered in determining the electrical energy output capacity of the affected facility.

"Potential electrical output capacity" is defined as 33 percent of the maximum design heat input capacity of the steam generating unit (e.g., a steam generating unit with a 100-MW (340 million Btu/hr) fossil-fuel heat input capacity would have a 33-MW potential electrical output capacity). For electric utility combined cycle gas turbines the potential electrical output capacity is determined on the basis of the fossil-fuel firing capacity of the steam generator exclusive of the heat input and electrical power contribution by the gas turbine.

"Anthracite" means coal that is classified as anthracite according to the American Society of Testing and Materials' (ASTM) Standard Specification for Classification of Coals by Rank D388-66.

"Solid-derived fuel" means any solid, liquid, or gaseous fuel derived from solid fuel for the purpose of creating useful heat and includes, but is not limited to, solvent refined coal, liquified coal, and gasified coal.

"24-hour period" means the period of time between 12:01 a.m. and 12:00 midnight.

"Resource recovery unit" means a facility that combusts more than 75 percent non-fossil fuel on a quarterly (calendar) heat input basis.

"Noncontinental area" means the State of Hawaii, the Virgin Islands, Guam, American Samoa, the Commonwealth of Puerto Rico, or the Northern Mariana Islands.

"Boiler operating day" means a 24-hour period during which fossil fuel is combusted in a steam generating unit for the entire 24 hours.

§ 60.42a Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted under § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases

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which contain particulate matter in excess of:

(1) 13 ng/J (0.03 lb/million Btu) heat input derived from the combustion of solid, liquid, or gaseous fuel;

(2) 1 percent of the potential combustion concentration (99 percent reduction) when combusting solid fuel; and

(3) 30 percent of potential combustion concentration (70 percent reduction) when combusting liquid fuel.

(b) On and after the date the particulate matter performance test required to be conducted under § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which exhibit greater than 20 percent opacity (6-minute average), except for one 6-minute period per hour of not more than 27 percent opacity.

§ 60.43a Standard for sulfur dioxide.

(a) On and after the date on which the initial performance test required to be conducted under § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility which combusts solid fuel or solid-derived fuel, except as provided under paragraphs (c), (d), (f) or (h) of this section, any gases which contain sulfur dioxide in excess of:

(1) 520 ng/J (1.20 lb/million Btu) heat input and 10 percent of the potential combustion concentration (90 percent reduction), or

(2) 30 percent of the potential combustion concentration (70 percent reduction), when emissions are less than 260 ng/J (0.60 lb/million Btu) heat input.

(b) On and after the date on which the initial performance test required to be conducted under § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility which combusts liquid or gaseous fuels (except for liquid or gaseous fuels derived from solid fuels and as provided under paragraphs (e) or (h) of this section), any gases which contain sulfur dioxide in excess of:

(1) 340 ng/J (0.80 lb/million Btu) heat input and 10 percent of the potential combustion concentration (90 percent reduction), or

(2) 100 percent of the potential combustion concentration (zero percent reduction) when emissions are less than 86 ng/J (0.20 lb/million Btu) heat input.

(c) On and after the date on which the initial performance test required to be conducted under § 60.8 is complete, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility which combusts solid solvent refined coal (SRC-I) any gases which contain sulfur dioxide in excess of 520 ng/J (1.20 lb/million Btu) heat input and 15 percent of the potential combustion concentration (85 percent reduction) except as provided under paragraph (f) of this section; compliance with the emission limitation is determined on a 30-day rolling average basis and compliance with the percent reduction requirement is determined on a 24-hour basis.

(d) Sulfur dioxide emissions are limited to 520 ng/J (1.20 lb/million Btu) heat input from any affected facility which:

(1) Combusts 100 percent anthracite,

(2) Is classified as a resource recovery facility, or

(3) Is located in a noncontinental area and combusts solid fuel or solid-derived fuel.

(e) Sulfur dixoide emissions are limited to 340 ng/J (0.80 lb/million Btu) heat input from any affected facility which is located in a noncontinental area and combusts liquid or gaseous fuels (excluding solid-derived fuels).

(f) The emission reduction requirements under this section do not apply to any affected facility that is operated under an SO_2 commercial demonstration permit issued by the Administrator in accordance with the provisions of § 60.45a.

(g) Compliance with the emission limitation and percent reduction requirements under this section are both determined on a 30-day rolling average

basis except as provided under paragraph (c) of this section.

(h) When different fuels are combusted simultaneously, the applicable standard is determined by proration using the following formula:

(1) If emissions of sulfur dioxide to the atmosphere are greater than 260 ng/J (0.60 lb/million Btu) heat input

$E_{SO2} = [340\ x + 520\ y]/100$ and
$P_{SO2} = 10$ percent

(2) If emissions of sulfur dioxide to the atmosphere are equal to or less than 260 ng/J (0.60 lb/million Btu) heat input:

$E_{SO2} = [340\ x + 520\ y]/100$ and
$P_{SO2} = [90\ x + 70\ y]/100$

where:

E_{SO2} is the prorated sulfur dioxide emission limit (ng/J heat input),

P_{SO2} is the percentage of potential sulfur dioxide emission allowed (percent reduction required = $100 - P_{SO2}$),

x is the percentage of total heat input derived from the combustion of liquid or gaseous fuels (excluding solid-derived fuels)

y is the percentage of total heat input derived from the combustion of solid fuel (including solid-derived fuels)

§ 60.44a Standard for nitrogen oxides.

(a) On and after the date on which the initial performance test required to be conducted under § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility, except as provided under paragraph (b) of this section, any gases which contain nitrogen oxides in excess of the following emission limits, based on a 30-day rolling average.

(1) NO_x Emission Limits—

Fuel type	Emission limit for heat input	
	ng/J	(lb/million Btu)
Gaseous fuels:		
Coal-derived fuels	210	0.50
All other fuels	86	0.20
Liquid fuels:		
Coal-derived fuels	210	0.50
Shale oil	210	0.50
All other fuels	130	0.30
Solid fuels:		
Coal-derived fuels	210	0.50
Any fuel containing more than 25%, by weight, coal refuse	(1)	(1)
Any fuel containing more than 25%, by weight, lignite if the lignite is mined in North Dakota, South Dakota, or Montana, and is combusted in a slag tap furnace	340	0.80
Lignite not subject to the 340 ng/J heat input emission limit	260	0.60
Subbituminous coal	210	0.50
Bituminous coal	260	0.60
Anthracite coal	260	0.60
All other fuels	260	0.60

[1] Exempt from NO_x standards and NO_x monitoring requirements.

(2) NO_x reduction requirements—

Fuel type	Percent reduction of potential combustion concentration
Gaseous fuels	25
Liquid fuels	30
Solid fuels	65

(b) The emission limitations under paragraph (a) of this section do not apply to any affected facility which is combusting coal-derived liquid fuel and is operating under a commercial demonstration permit issued by the Administrator in accordance with the provisions of § 60.45a.

(c) When two or more fuels are combusted simultaneously, the applicable standard is determined by proration using the following formula:

$E_{NO2} = [86\ w + 130\ x + 210\ y + 260\ z]/100$

where:

E_{NO2} is the applicable standard for nitrogen oxides when multiple fuels are combusted simultaneously (ng/J heat input);

w is the percentage of total heat input derived from the combustion of fuels subject to the 86 ng/J heat input standard;

x is the percentage of total heat input derived from the combustion of fuels subject to the 130 ng/J heat input standard;

y is the percentage of total heat input derived from the combustion of fuels subject to the 210 ng/J heat input standard; and

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z is the percentage of total heat input derived from the combustion of fuels subject to the 260 ng/J heat input standard.

§ 60.45a Commercial demonstration permit.

(a) An owner or operator of an affected facility proposing to demonstrate an emerging technology may apply to the Administrator for a commercial demonstration permit. The Administrator will issue a commercial demonstration permit in accordance with paragraph (e) of this section. Commercial demonstration permits may be issued only by the Administrator, and this authority will not be delegated.

(b) An owner or operator of an affected facility that combusts solid solvent refined coal (SRC-I) and who is issued a commercial demonstration permit by the Administrator is not subject to the SO_2 emission reduction requirements under § 60.43a(c) but must, as a minimum, reduce SO_2 emissions to 20 percent of the potential combustion concentration (80 percent reduction) for each 24-hour period of steam generator operation and to less than 520 ng/J (1.20 lb/million Btu) heat input on a 30-day rolling average basis.

(c) An owner or operator of a fluidized bed combustion electric utility steam generator (atmospheric or pressurized) who is issued a commercial demonstration permit by the Administrator is not subject to the SO_2 emission reduction requirements under § 60.43a(a) but must, as a minimum, reduce SO_2 emissions to 15 percent of the potential combustion concentration (85 percent reduction) on a 30-day rolling average basis and to less than 520 ng/J (1.20 lb/million Btu) heat input on a 30-day rolling average basis.

(d) The owner or operator of an affected facility that combusts coal-derived liquid fuel and who is issued a commercial demonstration permit by the Administrator is not subject to the applicable NO_x emission limitation and percent reduction under § 60.44a(a) but must, as a minimum, reduce emissions to less than 300 ng/J (0.70 lb/million Btu) heat input on a 30-day rolling average basis.

(e) Commercial demonstration permits may not exceed the following equivalent MW electrical generation capacity for any one technology category, and the total equivalent MW electrical generation capacity for all commercial demonstration plants may not exceed 15,000 MW.

Technology	Pollutant	Equivalent electrical capacity (MW electrical output)
Solid solvent refined coal (SRC I)	SO_2	6,000–10,000
Fluidized bed combustion (atmospheric)	SO_2	400–3,000
Fluidized bed combustion (pressurized)	SO_2	400–1,200
Coal liquification	SO_2	750–10,000
	NO_x	
Total allowable for all technologies		15,000

§ 60.46a Compliance provisions.

(a) Compliance with the particulate matter emission limitation under § 60.42a(a)(1) constitutes compliance with the percent reduction requirements for particulate matter under § 60.42a(a)(2) and (3).

(b) Compliance with the nitrogen oxides emission limitation under § 60.44a(a) constitutes compliance with the percent reduction requirements under § 60.44a(a)(2).

(c) The particulate matter emission standards under § 60.42a and the nitrogen oxides emission standards under § 60.44a apply at all times except during periods of startup, shutdown, or malfunction. The sulfur dioxide emission standards under § 60.43a apply at all times except during periods of startup, shutdown, or when both emergency conditions exist and the procedures under paragraph (d) of this section are implemented.

(d) During emergency conditions in the principal company, an affected facility with a malfunctioning flue gas desulfurization system may be operated if sulfur dioxide emissions are minimized by:

(1) Operating all operable flue gas desulfurization system modules, and bringing back into operation any mal-

functioned module as soon as repairs are completed,

(2) Bypassing flue gases around only those flue gas desulfurization system modules that have been taken out of operation because they were incapable of any sulfur dioxide emission reduction or which would have suffered significant physical damage if they had remained in operation, and

(3) Designing, constructing, and operating a spare flue gas desulfurization system module for an affected facility larger than 365 MW (1,250 million Btu/hr) heat input (approximately 125 MW electrical output capacity). The Administrator may at his discretion require the owner or operator within 60 days of notification to demonstrate spare module capability. To demonstrate this capability, the owner or operator must demonstrate compliance with the appropriate requirements under paragraph (a), (b), (d), (e), and (i) under § 60.43a for any period of operation lasting from 24 hours to 30 days when:

(i) Any one flue gas desulfurization module is not operated,

(ii) The affected facility is operating at the maximum heat input rate,

(iii) The fuel fired during the 24-hour to 30-day period is representative of the type and average sulfur content of fuel used over a typical 30-day period, and

(iv) The owner or operator has given the Administrator at least 30 days notice of the date and period of time over which the demonstration will be performed.

(e) After the initial performance test required under § 60.8, compliance with the sulfur dioxide emission limitations and percentage reduction requirements under § 60.43a and the nitrogen oxides emission limitations under § 60.44a is based on the average emission rate for 30 successive boiler operating days. A separate performance test is completed at the end of each boiler operating day after the initial performance test, and a new 30 day average emission rate for both sulfur dioxide and nitrogen oxides and a new percent reduction for sulfur dioxide are calculated to show compliance with the standards.

(f) For the initial performance test required under § 60.8, compliance with the sulfur dioxide emission limitations and percent reduction requirements under § 60.43a and the nitrogen oxides emission limitation under § 60.44a is based on the average emission rates for sulfur dioxide, nitrogen oxides, and percent reduction for sulfur dioxide for the first 30 successive boiler operating days. The initial performance test is the only test in which at least 30 days prior notice is required unless otherwise specified by the Administrator. The initial performance test is to be scheduled so that the first boiler operating day of the 30 successive boiler operating days is completed within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of the facility.

(g) Compliance is determined by calculating the arithmetic average of all hourly emission rates for SO_2 and NO_x for the 30 successive boiler operating days, except for data obtained during startup, shutdown, malfunction (NO_x only), or emergency conditions (SO_2 only). Compliance with the percentage reduction requirement for SO_2 is determined based on the average inlet and average outlet SO_2 emission rates for the 30 successive boiler operating days.

(h) If an owner or operator has not obtained the minimum quantity of emission data as required under § 60.47a of this subpart, compliance of the affected facility with the emission requirements under §§ 60.43a and 60.44a of this subpart for the day on which the 30-day period ends may be determined by the Administrator by following the applicable procedures in sections 6.0 and 7.0 of Reference Method 19 (Appendix A).

§ 60.47a Emission monitoring.

(a) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring the opacity of emissions discharged to the atmosphere, except where gaseous fuel is the only fuel combusted. If

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opacity interference due to water droplets exists in the stack (for example, from the use of an FGD system), the opacity is monitored upstream of the interference (at the inlet to the FGD system). If opacity interference is experienced at all locations (both at the inlet and outlet of the sulfur dioxide control system), alternate parameters indicative of the particulate matter control system's performance are monitored (subject to the approval of the Administrator).

(b) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring sulfur dioxide emissions, except where natural gas is the only fuel combusted, as follows:

(1) Sulfur dioxide emissions are monitored at both the inlet and outlet of the sulfur dioxide control device.

(2) For a facility which qualifies under the provisions of § 60.43a(d), sulfur dioxide emissions are only monitored as discharged to the atmosphere.

(3) An "as fired" fuel monitoring system (upstream of coal pulverizers) meeting the requirements of Method 19 (Appendix A) may be used to determine potential sulfur dioxide emissions in place of a continuous sulfur dioxide emission monitor at the inlet to the sulfur dioxide control device as required under paragraph (b)(1) of this section.

(c) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring nitrogen oxides emissions discharged to the atmosphere.

(d) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring the oxygen or carbon dioxide content of the flue gases at each location where sulfur dioxide or nitrogen oxides emissions are monitored.

(e) The continuous monitoring systems under paragraphs (b), (c), and (d) of this section are operated and data recorded during all periods of operation of the affected facility including periods of startup, shutdown, malfunction or emergency conditions, except for continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments.

(f) When emission data are not obtained because of continuous monitoring system breakdowns, repairs, calibration checks and zero and span adjustments, emission data will be obtained by using other monitoring systems as approved by the Administrator or the reference methods as described in paragraph (h) of this section to provide emission data for a minimum of 18 hours in at least 22 out of 30 successive boiler operating days.

(g) The 1-hour averages required under paragraph § 60.13(h) are expressed in ng/J (lbs/million Btu) heat input and used to calculate the average emission rates under § 60.46a. The 1-hour averages are calculated using the data points required under § 60.13(b). At least two data points must be used to calculate the 1-hour averages.

(h) Reference methods used to supplement continuous monitoring system data to meet the minimum data requirements in paragraph § 60.47a(f) will be used as specified below or otherwise approved by the Administrator.

(1) Reference Methods 3, 6, and 7, as applicable, are used. The sampling location(s) are the same as those used for the continuous monitoring system.

(2) For Method 6, the minimum sampling time is 20 minutes and the minimum sampling volume is 0.02 dscm (0.71 dscf) for each sample. Samples are taken at approximately 60-minute intervals. Each sample represents a 1-hour average.

(3) For Method 7, samples are taken at approximately 30-minute intervals. The arithmetic average of these two consective samples represent a 1-hour average.

(4) For Method 3, the oxygen or carbon dioxide sample is to be taken for each hour when continuous SO_2 and NO_x data are taken or when Methods 6 and 7 are required. Each sample shall be taken for a minimum of 30 minutes in each hour using the inte-

grated bag method specified in Method 3. Each sample represents a 1-hour average.

(5) For each 1-hour average, the emissions expressed in ng/J (lb/million Btu) heat input are determined and used as needed to achieve the minimum data requirements of paragraph (f) of this section.

(i) The following procedures are used to conduct monitoring system performance evaluations under § 60.13(c) and calibration checks under § 60.13(d).

(1) Reference method 6 or 7, as applicable, is used for conducting performance evaluations of sulfur dioxide and nitrogen oxides continuous monitoring systems.

(2) Sulfur dioxide or nitrogen oxides, as applicable, is used for preparing calibration gas mixtures under performance specification 2 of appendix B to this part.

(3) For affected facilities burning only fossil fuel, the span value for a continuous monitoring system for measuring opacity is between 60 and 80 percent and for a continuous monitoring system measuring nitrogen oxides is determined as follows:

Fossil fuel	Span value for nitrogen oxides (ppm)
Gas	500
Liquid	500
Solid	1,000
Combination	500 (x+y)+1,000z

where:
x is the fraction of total heat input derived from gaseous fossil fuel,
y is the fraction of total heat input derived from liquid fossil fuel, and
z is the fraction of total heat input derived from solid fossil fuel.

(4) All span values computed under paragraph (b)(3) of this section for burning combinations of fossil fuels are rounded to the nearest 500 ppm.

(5) For affected facilities burning fossil fuel, alone or in combination with non-fossil fuel, the span value of the sulfur dioxide continuous monitoring system at the inlet to the sulfur dioxide control device is 125 percent of the maximum estimated hourly potential emissions of the fuel fired, and the outlet of the sulfur dioxide control device is 50 percent of maximum estimated hourly potential emissions of the fuel fired.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

§ 60.48a Compliance determination procedures and methods.

(a) The following procedures and reference methods are used to determine compliance with the standards for particulate matter under § 60.42a.

(1) Method 3 is used for gas analysis when applying method 5 or method 17.

(2) Method 5 is used for determining particulate matter emissions and associated moisture content. Method 17 may be used for stack gas temperatures less than 160 C (320 F).

(3) For Methods 5 or 17, Method 1 is used to select the sampling site and the number of traverse sampling points. The sampling time for each run is at least 120 minutes and the minimum sampling volume is 1.7 dscm (60 dscf) except that smaller sampling times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(4) For Method 5, the probe and filter holder heating system in the sampling train is set to provide a gas temperature no greater than 160°C (32°F).

(5) For determination of particulate emissions, the oxygen or carbon-dioxide sample is obtained simultaneously with each run of Methods 5 or 17 by traversing the duct at the same sampling location. Method 1 is used for selection of the number of traverse points except that no more than 12 sample points are required.

(6) For each run using Methods 5 or 17, the emission rate expressed in ng/J heat input is determined using the oxygen or carbon-dioxide measurements and particulate matter measurements obtained under this section, the dry basis F_c-factor and the dry basis emission rate calculation procedure contained in Method 19 (Appendix A).

(7) Prior to the Administrator's issuance of a particulate matter reference method that does not experience sul-

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furic acid mist interference problems, particulate matter emissions may be sampled prior to a wet flue gas desulfurization system.

(b) The following procedures and methods are used to determine compliance with the sulfur dioxide standards under § 60.43a.

(1) Determine the percent of potential combustion concentration (percent PCC) emitted to the atmosphere as follows:

(i) *Fuel Pretreatment (% R_f):* Determine the percent reduction achieved by any fuel pretreatment using the procedures in Method 19 (Appendix A). Calculate the average percent reduction for fuel pretreatment on a quarterly basis using fuel analysis data. The determination of percent R_f to calculate the percent of potential combustion concentration emitted to the atmosphere is optional. For purposes of determining compliance with any percent reduction requirements under § 60.43a, any reduction in potential SO_2 emissions resulting from the following processes may be credited:

(A) Fuel pretreatment (physical coal cleaning, hydrodesulfurization of fuel oil, etc.),

(B) Coal pulverizers, and

(C) Bottom and flyash interactions.

(ii) *Sulfur Dioxide Control System (% R_g):* Determine the percent sulfur dioxide reduction achieved by any sulfur dioxide control system using emission rates measured before and after the control system, following the procedures in Method 19 (Appendix A); or, a combination of an "as fired" fuel monitor and emission rates measured after the control system, following the procedures in Method 19 (Appendix A). When the "as fired" fuel monitor is used, the percent reduction is calculated using the average emission rate from the sulfur dioxide control device and the average SO_2 input rate from the "as fired" fuel analysis for 30 successive boiler operating days.

(iii) *Overall percent reduction (% R_o):* Determine the overall percent reduction using the results obtained in paragraphs (b)(1) (i) and (ii) of this section following the procedures in Method 19 (Appendix A). Results are calculated for each 30-day period using the quarterly average percent sulfur reduction determined for fuel pretreatment from the previous quarter and the sulfur dioxide reduction achieved by a sulfur dioxide control system for each 30-day period in the current quarter.

(iv) *Percent emitted (% PCC):* Calculate the percent of potential combustion concentration emitted to the atmosphere using the following equation: Percent PCC = 100 − Percent R_o

(2) Determine the sulfur dioxide emission rates following the procedures in Method 19 (Appendix A).

(c) The procedures and methods outlined in Method 19 (Appendix A) are used in conjunction with the 30-day nitrogen-oxides emission data collected under § 60.47a to determine compliance with the applicable nitrogen oxides standard under § 60.44.

(d) Electric utility combined cycle gas turbines are performance tested for particulate matter, sulfur dioxide, and nitrogen oxides using the procedures of Method 19 (Appendix A). The sulfur dioxide and nitrogen oxides emission rates from the gas turbine used in Method 19 (Appendix A) calculations are determined when the gas turbine is performance tested under subpart GG. The potential uncontrolled particulate matter emission rate from a gas turbine is defined as 17 ng/J (0.04 lb/million Btu) heat input.

§ 60.49a Reporting requirements.

(a) For sulfur dioxide, nitrogen oxides, and particulate matter emissions, the performance test data from the initial performance test and from the performance evaluation of the continuous monitors (including the transmissometer) are submitted to the Administrator.

(b) For sulfur dioxide and nitrogen oxides the following information is reported to the Administrator for each 24-hour period.

(1) Calendar date.

(2) The average sulfur dioxide and nitrogen oxide emission rates (ng/J or lb/million Btu) for each 30 successive boiler operating days, ending with the last 30-day period in the quarter; reasons for non-compliance with the emission standards; and, description of corrective actions taken.

(3) Percent reduction of the potential combustion concentration of sulfur dioxide for each 30 successive boiler operating days, ending with the last 30-day period in the quarter; reasons for non-compliance with the standard; and, description of corrective actions taken.

(4) Identification of the boiler operating days for which pollutant or diluent data have not been obtained by an approved method for at least 18 hours of operation of the facility; justification for not obtaining sufficient data; and description of corrective actions taken.

(5) Identification of the times when emissions data have been excluded from the calculation of average emission rates because of startup, shutdown, malfunction (NO_x only), emergency conditions (SO_2 only), or other reasons, and justification for excluding data for reasons other than startup, shutdown, malfunction, or emergency conditions.

(6) Identification of "F" factor used for calculations, method of determination, and type of fuel combusted.

(7) Identification of times when hourly averages have been obtained based on manual sampling methods.

(8) Identification of the times when the pollutant concentration exceeded full span of the continuous monitoring system.

(9) Description of any modifications to the continuous monitoring system which could affect the ability of the continuous monitoring system to comply with Performance Specifications 2 or 3.

(c) If the minimum quantity of emission data as required by § 60.47a is not obtained for any 30 successive boiler operating days, the following information obtained under the requirements of § 60.46a(h) is reported to the Administrator for that 30-day period:

(1) The number of hourly averages available for outlet emission rates (n_o) and inlet emission rates (n_i) as applicable.

(2) The standard deviation of hourly averages for outlet emission rates (s_o) and inlet emission rates (s_i) as applicable.

(3) The lower confidence limit for the mean outlet emission rate (E_o*) and the upper confidence limit for the mean inlet emission rate (E_i*) as applicable.

(4) The applicable potential combustion concentration.

(5) The ratio of the upper confidence limit for the mean outlet emission rate (E_o*) and the allowable emission rate (E_{std}) as applicable.

(d) If any standards under § 60.43a are exceeded during emergency conditions because of control system malfunction, the owner or operator of the affected facility shall submit a signed statement:

(1) Indicating if emergency conditions existed and requirements under § 60.46a(d) were met during each period, and

(2) Listing the following information:

(i) Time periods the emergency condition existed;

(ii) Electrical output and demand on the owner or operator's electric utility system and the affected facility;

(iii) Amount of power purchased from interconnected neighboring utility companies during the emergency period;

(iv) Percent reduction in emissions achieved;

(v) Atmospheric emission rate (ng/J) of the pollutant discharged; and

(vi) Actions taken to correct control system malfunction.

(e) If fuel pretreatment credit toward the sulfur dioxide emission standard under § 60.43a is claimed, the owner or operator of the affected facility shall submit a signed statement:

(1) Indicating what percentage cleaning credit was taken for the calendar quarter, and whether the credit was determined in accordance with the provisions of § 60.48a and Method 19 (Appendix A); and

(2) Listing the quantity, heat content, and date each pretreated fuel shipment was received during the previous quarter; the name and location of the fuel pretreatment facility; and the total quantity and total heat content of all fuels received at the affected facility during the previous quarter.

(f) For any periods for which opacity, sulfur dioxide or nitrogen oxides emissions data are not available, the owner or operator of the affected fa-

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cility shall submit a signed statement indicating if any changes were made in operation of the emission control system during the period of data unavailability. Operations of the control system and affected facility during periods of data unavailability are to be compared with operation of the control system and affected facility before and following the period of data unavailability.

(g) The owner or operator of the affected facility shall submit a signed statement indicating whether:

(1) The required continuous monitoring system calibration, span, and drift checks or other periodic audits have or have not been performed as specified.

(2) The data used to show compliance was or was not obtained in accordance with approved methods and procedures of this part and is representative of plant performance.

(3) The minimum data requirements have or have not been met; or, the minimum data requirements have not been met for errors that were unavoidable.

(4) Compliance with the standards has or has not been achieved during the reporting period.

(h) For the purposes of the reports required under § 60.7, periods of excess emissions are defined as all 6-minute periods during which the average opacity exceeds the applicable opacity standards under § 60.42a(b). Opacity levels in excess of the applicable opacity standard and the date of such excesses are to be submitted to the Administrator each calendar quarter.

(i) The owner or operator of an affected facility shall submit the written reports required under this section and subpart A to the Administrator for every calendar quarter. All quarterly reports shall be postmarked by the 30th day following the end of each calendar quarter.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

Subpart E—Standards of Performance for Incinerators

§ 60.50 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to each incinerator of more than 45 metric tons per day charging rate (50 tons/day), which is the affected facility.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(Secs. 111 and 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37936, July 25, 1977]

§ 60.51 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Incinerator" means any furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

(b) "Solid waste" means refuse, more than 50 percent of which is municipal type waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustibles, and noncombustible materials such as glass and rock.

(c) "Day" means 24 hours.

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 20792, June 14, 1974]

§ 60.52 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this part shall cause to be discharged into the atmosphere from any affected facility any gases which contain particulate matter in excess of 0.18 g/dscm (0.08 gr/dscf) corrected to 12 percent CO_2.

[39 FR 20792, June 14, 1974]

§ 60.53 Monitoring of operations.

(a) The owner or operator of any incinerator subject to the provisions of this part shall record the daily charging rates and hours of operation.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20792, June 14, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.54 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.52 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis and calculation of excess air, using the integrated sample technique.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be 0.85 dscm (30.0 dscf) except that smaller sampling times or sample volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) If a wet scrubber is used, the gas analysis sample shall reflect flue gas conditions after the scrubber, allowing for carbon dioxide absorption by sampling the gas on the scrubber inlet and outlet sides according to either the procedure under paragraphs (c)(1) through (c)(5) of this section or the procedure under paragraphs (c)(1), (c)(2) and (c)(6) of this section as follows:

(1) The outlet sampling site shall be the same as for the particulate matter measurement. The inlet site shall be selected according to Method 1, or as specified by the Administrator.

(2) Randomly select 9 sampling points within the cross-section at both the inlet and outlet sampling sites. Use the first set of three for the first run, the second set for the second run, and the third set for the third run.

(3) Simultaneously with each particulate matter run, extract and analyze for CO_2 an integrated gas sample according to Method 3, traversing the three sample points and sampling at each point for equal increments of time. Conduct the runs at both inlet and outlet sampling sites.

(4) Measure the volumetric flow rate at the inlet during each particulate matter run according to Method 2, using the full number of traverse points. For the inlet make two full velocity traverses approximately one hour apart during each run and average the results. The outlet volumetric flow rate may be determined from the particulate matter run (Method 5).

(5) Calculate the adjusted CO_2 percentage using the following equation:

$$(\%\ CO_2)_{adj} = (\%\ CO_2)_{di}\ (Q_{di}/Q_{do})$$

where:

$(\%\ CO_2)_{adj}$ is the adjusted CO_2 percentage which removes the effect of CO_2 absorption and dilution air,

$(\%\ CO_2)_{di}$ is the percentage of CO_2 measured before the scrubber, dry basis,

Q_{di} is the volumetric flow rate before the scrubber, average of two runs, dscf/min (using Method 2), and

Q_{do} is the volumetric flow rate after the scrubber, dscf/min (using Methods 2 and 5).

(6) Alternatively, the following procedures may be substituted for the procedures under paragraphs (c) (3), (4), and (5) of this section:

(i) Simultaneously with each particulate matter run, extract and analyze for CO_2, O_2, and N_2 an integrated gas sample according to Method 3, traversing the three sample points and sampling for equal increments of time at each point. Conduct the runs at both the inlet and outlet sampling sites.

(ii) After completing the analysis of the gas sample, calculate the percentage of excess air (% EA) for both the inlet and outlet sampling sites using equation 3-1 in Appendix A to this part.

(iii) Calculate the adjusted CO_2 percentage using the following equation:

$$(\%\ CO_2)_{adj} = (\%\ CO_2)_{di}\left[\frac{100 + (\%\ EA)_i}{100 + (\%\ EA)_o}\right]$$

where:

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($\%\ CO_2)_{adj}$ is the adjusted outlet CO_2 percentage,
($\%\ CO_2)_{di}$ is the percentage of CO_2 measured before the scrubber, dry basis,
($\%\ EA)_i$ is the percentage of excess air at the inlet, and
($\%\ EA)_o$ is the percentage of excess air at the outlet.

(d) Particulate matter emissions, expressed in g/dscm, shall be corrected to 12 percent CO_2 by using the following formula:

$$c_{12} = 12c/\%\ CO_2$$

where:
c_{12} is the concentration of particulate matter corrected to 12 percent CO_2, c is the concentration of particulate matter as measured by Method 5, and $\%\ CO_2$ is the percentage of CO_2 as measured by Method 3, or when applicable, the adjusted outlet CO_2 percentage as determined by paragraph (c) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20793, June 14, 1974]

Subpart F—Standards of Performance for Portland Cement Plants

§ 60.60 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in portland cement plants: Kiln, clinker cooler, raw mill system, finish mill system, raw mill dryer, raw material storage, clinker storage, finished product storage, conveyor transfer points, bagging and bulk loading and unloading systems.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(Secs. 111 and 301(a) of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37936, July 25, 1977]

§ 60.61 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Portland cement plant" means any facility manufacturing portland cement by either the wet or dry process.

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 20793, June 13, 1974]

§ 60.62 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any kiln any gases which:

(1) Contain particulate matter in excess of 0.15 kg per metric ton of feed (dry basis) to the kiln (0.30 lb per ton).

(2) Exhibit greater than 20 percent opacity.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any clinker cooler any gases which:

(1) Contain particulate matter in excess of 0.050 kg per metric ton of feed (dry basis) to the kiln (0.10 lb per ton).

(2) Exhibit 10 percent opacity, or greater.

(c) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility other than the kiln and clinker cooler any gases which exhibit 10 percent opacity, or greater.

[39 FR 20793, June 14, 1974, as amended at 39 FR 39874, Nov. 12, 1974; 40 FR 46258, Oct. 6, 1975]

§ 60.63 Monitoring of operations.

(a) The owner or operator of any portland cement plant subject to the provisions of this part shall record the daily production rates and kiln feed rates.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20793, June 14, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

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§ 60.64 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.62 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis.

(b) For Method 5, the minimum sampling time and minimum sample volume for each run, except when process variables or other factors justify otherwise to the satisfaction of the Administrator, shall be as follows:

(1) 60 minutes and 0.85 dscm (30.0 dscf) for the kiln.

(2) 60 minutes and 1.15 dscm (40.6 dscf) for the clinker cooler.

(c) Total kiln feed rate (except fuels), expressed in metric tons per hour on a dry basis, shall be determined during each testing period by suitable methods; and shall be confirmed by a material balance over the production system.

(d) For each run, particulate matter emissions, expressed in g/metric ton of kiln feed, shall be determined by dividing the emission rate in g/hr by the kiln feed rate. The emission rate shall be determined by the equation, $g/hr = Q_s \times c$, where Q_s = volumetric flow rate of the total effluent in dscm/hr as determined in accordance with paragraph (a)(3) of this section, and c = particulate concentration in g/dscm as determined in accordance with paragraph (a)(1) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20793, June 14, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart G—Standards of Performance for Nitric Acid Plants

§ 60.70 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to each nitric acid production unit, which is the affected facility.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(Secs. 111 and 301(a) of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37936, July 25, 1977]

§ 60.71 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Nitric acid production unit" means any facility producing weak nitric acid by either the pressure or atmospheric pressure process.

(b) "Weak nitric acid" means acid which is 30 to 70 percent in strength.

§ 60.72 Standard for nitrogen oxides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain nitrogen oxides, expressed as NO_2, in excess of 1.5 kg per metric ton of acid produced (3.0 lb per ton), the production being expressed as 100 percent nitric acid.

(2) Exhibit 10 percent opacity, or greater.

[39 FR 20794, June 14, 1974, as amended at 40 FR 46258, Oct. 6, 1975]

§ 60.73 Emission monitoring.

(a) A continuous monitoring system for the measurement of nitrogen oxides shall be installed, calibrated, maintained, and operated by the owner or operator. The pollutant gas used to prepare calibration gas mixtures under paragraph 2.1, Performance Specification 2 and for calibration checks under § 60.13(d) to this part, shall be nitrogen dioxide (NO_2). The span shall be set at 500 ppm of nitrogen dioxide. Reference Method 7 shall be used for conducting monitoring system performance evaluations under § 60.13(c).

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(b) The owner or operator shall establish a conversion factor for the purpose of converting monitoring data into units of the applicable standard (kg/metric ton, lb/short ton). The conversion factor shall be established by measuring emissions with the continuous monitoring system concurrent with measuring emissions with the applicable reference method tests. Using only that portion of the continuous monitoring emission data that represents emission measurements concurrent with the reference method test periods, the conversion factor shall be determined by dividing the reference method test data averages by the monitoring data averages to obtain a ratio expressed in units of the applicable standard to units of the monitoring data, i.e., kg/metric ton per ppm (lb/short ton per ppm). The conversion factor shall be reestablished during any performance test under § 60.8 or any continuous monitoring system performance evaluation under § 60.13(c).

(c) The owner or operator shall record the daily production rate and hours of operation.

(d) [Reserved]

(e) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as any 3-hour period during which the average nitrogen oxides emissions (arithmetic average of three contiguous 1-hour periods) as measured by a continuous monitoring system exceed the standard under § 60.72(a).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20794, June 14, 1974, as amended at 40 FR 46258, Oct. 6, 1975; 43 FR 8800, Mar. 3, 1978]

§ 60.74 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.72 as follows:

(1) Method 7 for the concentration of NO_x;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis.

(b) For Method 7, the sample site shall be selected according to Method 1 and the sampling point shall be the centroid of the stack or duct or at a point no closer to the walls than 1 m (3.28 ft). Each run shall consist of at least four grab samples taken at approximately 15-minute intervals. The arithmetic mean of the samples shall constitute the run value. A velocity traverse shall be performed once per run.

(c) Acid production rate, expressed in metric tons per hour of 100 percent nitric acid, shall be determined during each testing period by suitable methods and shall be confirmed by a material balance over the production system.

(d) For each run, nitrogen oxides, expressed in g/metric ton of 100 percent nitric acid, shall be determined by dividing the emission rate in g/hr by the acid production rate. The emission rate shall be determined by the equation,

$$g/hr = Q_s \times c$$

where Q_s = volumetric flow rate of the effluent in dscm/hr, as determined in accordance with paragraph (a)(2) of this section, and $c = NO_x$ concentration in g/dscm, as determined in accordance with paragraph (a)(1) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20794, June 14, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart H—Standards of Performance for Sulfuric Acid Plants

§ 60.80 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to each sulfuric acid production unit, which is the affected facility.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(Secs. 111 and 301(a) of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec.

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2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37936, July 25, 1977]

§ 60.81 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Sulfuric acid production unit" means any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, organic sulfides and mercaptans, or acid sludge, but does not include facilities where conversion to sulfuric acid is utilized primarily as a means of preventing emissions to the atmosphere of sulfur dioxide or other sulfur compounds.

(b) "Acid mist" means sulfuric acid mist, as measured by Method 8 of Appendix A to this part or an equivalent or alternative method.

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 20794, June 14, 1974]

§ 60.82 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain sulfur dioxide in excess of 2 kg per metric ton of acid produced (4 lb per ton), the production being expressed as 100 percent H_2SO_4.

[39 FR 20794, June 14, 1974]

§ 60.83 Standard for acid mist.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain acid mist, expressed as H_2SO_4, in excess of 0.075 kg per metric ton of acid produced (0.15 lb per ton), the production being expressed as 100 percent H_2SO_4.

(2) Exhibit 10 percent opacity, or greater.

[39 FR 20794, June 14, 1974, as amended at 40 FR 46258, Oct. 6, 1975]

§ 60.84 Emission monitoring.

(a) A continuous monitoring system for the measurement of sulfur dioxide shall be installed, calibrated, maintained, and operated by the owner or operator. The pollutant gas used to prepare calibration gas mixtures under paragraph 2.1, Performance Specification 2 and for calibration checks under § 60.13(d), shall be sulfur dioxide (SO_2). Reference Method 8 shall be used for conducting monitoring system performance evaluations under § 60.13(c) except that only the sulfur dioxide portion of the Method 8 results shall be used. The span shall be set at 1000 ppm of sulfur dioxide.

(b) The owner or operator shall establish a conversion factor for the purpose of converting monitoring data into units of the applicable standard (kg/metric ton, lb/short ton). The conversion factor shall be determined, as a minimum, three times daily by measuring the concentration of sulfur dioxide entering the converter using suitable methods (e.g., the Reich test, National Air Pollution Control Administration Publication No. 999-AP-13) and calculating the appropriate conversion factor for each eight-hour period as follows:

$$CF = k[1.000 - 0.015r/r - s]$$

where:

CF = conversion factor (kg/metric ton per ppm, lb/short ton per ppm).

k = constant derived from material balance. For determining CF in metric units, k = 0.0653. For determining CF in English units, k = 0.1306.

r = percentage of sulfur dioxide by volume entering the gas converter. Appropriate corrections must be made for air injection plants subject to the Administrator's approval.

s = percentage of sulfur dioxide by volume in the emissions to the atmosphere determined by the continuous monitoring system required under paragraph (a) of this section.

(c) The owner or operator shall record all conversion factors and values under paragraph (b) of this section from which they were computed (i.e., CF, r, and s).

(d) [Reserved]

(e) For the purpose of reports under § 60.7(c), periods of excess emissions shall be all three-hour periods (or the

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arithmetic average of three consecutive one-hour periods) during which the integrated average sulfur dioxide emissions exceed the applicable standards under § 60.82.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20794, June 14, 1974, as amended at 40 FR 46258, Oct. 6, 1975; 43 FR 8800, Mar. 3, 1978]

§ 60.85 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in §§ 60.82 and 60.83 as follows:

(1) Method 8 for the concentrations of SO_2 and acid mist;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis.

(b) The moisture content can be considered to be zero. For Method 8 the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be 1.15 dscm (40.6 dscf) except that smaller sampling times or sample volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) Acid production rate, expressed in metric tons per hour of 100 percent H_2SO_4, shall be determined during each testing period by suitable methods and shall be confirmed by a material balance over the production system.

(d) Acid mist and sulfur dioxide emissions, expressed in g/metric ton of 100 percent H_2SO_4, shall be determined by dividing the emission rate in g/hr by the acid production rate. The emission rate shall be determined by the equation, $g/hr = Q_s \times c$, where Q_s = volumetric flow rate of the effluent in dscm/hr as determined in accordance with paragraph (a)(3) of this section, and c = acid mist and SO_2 concentrations in g/dscm as determined in accordance with paragraph (a)(1) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 20794, June 14, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart I—Standards of Performance for Asphalt Concrete Plants

§ 60.90 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each asphalt concrete plant. For the purpose of this subpart, an asphalt concrete plant is comprised only of any combination of the following: Dryers; systems for screening, handling, storing, and weighing hot aggregate; systems for loading, transferring, and storing mineral filler; systems for mixing asphalt concrete; and the loading, transfer, and storage systems associated with emission control systems.

(b) Any facility under paragraph (a) of this section that commences construction or modification after June 11, 1973, is subject to the requirements of this subpart.

(Secs. 111 and 301(a) of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37936, July 25, 1977]

§ 60.91 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Asphalt concrete plant" means any facility, as described in § 60.90, used to manufacture asphalt concrete by heating and drying aggregate and mixing with asphalt cements.

§ 60.92 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of 90 mg/dscm (0.04 gr/dscf).

(2) Exhibit 20 percent opacity, or greater.

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[39 FR 9314, Mar. 8, 1974, as amended at 40 FR 46259, Oct. 6, 1975]

§ 60.93 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.92 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.9 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9314, Mar. 8, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart J—Standards of Performance for Petroleum Refineries

§ 60.100 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in petroleum refineries: fluid catalytic cracking unit catalyst regenerators, fuel gas combustion devices, and all Claus sulfur recovery plants except Claus plants of 20 long tons per day (LTD) or less. The Claus sulfur recovery plant need not be physically located within the boundaries of a petroleum refinery to be an affected facility, provided it processes gases produced within a petroleum refinery.

(b) Any fluid catalytic cracking unit catalyst regenerator or fuel gas combustion device under paragraph (a) of this section which commences construction or modification after June 11, 1973, or any Claus sulfur recovery plant under paragraph (a) of this section which commences construction or modification after October 4, 1976, is subject to the requirements of this part.

(Secs. 111, 114, 301(a), Clean Air Act, as amended (42 U.S.C. 7411, 7414, 7601(a)))

[43 FR 10868, Mar. 15, 1978, as amended at 44 FR 61543, Oct. 25, 1979]

§ 60.101 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A.

(a) "Petroleum refinery" means any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking or reforming of unfinished petroleum derivatives.

(b) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.

(c) "Process gas" means any gas generated by a petroleum refinery process unit, except fuel gas and process upset gas as defined in this section.

(d) "Fuel gas" means any gas which is generated at a petroleum refinery and which is combusted. Fuel gas also includes natural gas when the natural gas is combined and combusted in any proportion with a gas generated at a refinery. Fuel gas does not include gases generated by catalytic cracking unit catalyst regenerators and fluid coking burners.

(e) "Process upset gas" means any gas generated by a petroleum refinery process unit as a result of start-up, shut-down, upset or malfunction.

(f) "Refinery process unit" means any segment of the petroleum refinery in which a specific processing operation is conducted.

(g) "Fuel gas combustion device" means any equipment, such as process heaters, boilers and flares used to combust fuel gas, except facilities in which gases are combusted to produce sulfur or sulfuric acid.

(h) "Coke burn-off" means the coke removed from the surface of the fluid catalytic cracking unit catalyst by combustion in the catalyst regenerator. The rate of coke burn-off is calculated by the formula specified in § 60.106.

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(i) "Claus sulfur recovery plant" means a process unit which recovers sulfur from hydrogen sulfide by a vapor-phase catalytic reaction of sulfur dioxide and hydrogen sulfide.

(j) "Oxidation control system" means an emission control system which reduces emissions from sulfur recovery plants by converting these emissions to sulfur dioxide.

(k) "Reduction control system" means an emission control system which reduces emissions from sulfur recovery plants by converting these emissions to hydrogen sulfide.

(l) "Reduced sulfur compounds" means hydrogen sulfide (H_2S), carbonyl sulfide (COS) and carbon disulfide (CS_2).

(Sec. 114, Clean Air Act, as amended (42 U.S.C. 7414))

[39 FR 9315, Mar. 8, 1974, as amended at 43 FR 10868, Mar. 15, 1978; 44 FR 13481, Mar. 12, 1979; 44 FR 61543, Oct. 25, 1979; 45 FR 79453, Dec. 1, 1980]

§ 60.102 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any fluid catalytic cracking unit catalyst regenerator or from any fluid catalytic cracking unit regenerator:

(1) Particulate matter in excess of 1.0 kg/1000 kg (1.0 lb/1000 lb) of coke burn-off in the catalyst regenerator.

(2) Gases exhibiting greater than 30 percent opacity, except for one six-minute average opacity reading in any one hour period.

(b) Where the gases discharged by the fluid catalytic cracking unit catalyst regenerator pass through an incinerator or waste heat boiler in which auxiliary or supplemental liquid or solid fossil fuel is burned, particulate matter in excess of that permitted by paragraph (a)(1) of this section may be emitted to the atmosphere, except that the incremental rate of particulate matter emissions shall not exceed 43.0 g/MJ (0.10 lb/million Btu) of heat input attributable to such liquid or solid fossil fuel.

(Sec. 111, 114, Pub. L. 91-604, 84 Stat. 1683 (42 U.S.C. 1857c-6, 1857-9, 7414); sec. 301(a), Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857g(a)))

[39 FR 9315, Mar. 8, 1974, as amended at 42 FR 32427, June 24, 1977; 42 FR 39389, Aug. 4, 1977; 43 FR 10868, Feb. 15, 1978]

§ 60.103 Standard for carbon monoxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from the fluid catalytic cracking unit catalyst regenerator any gases which contain carbon monoxide in excess of 0.050 percent by volume.

[39 FR 9315, Mar. 8, 1974]

§ 60.104 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall:

(1) Burn in any fuel gas combustion device any fuel gas which contains hydrogen sulfide in excess of 230 mg/dscm (0.10 gr/dscf), except that the gases resulting from the combustion of fuel gas may be treated to control sulfur dioxide emissions provided the owner or operator demonstrates to the satisfaction of the Administrator that this is as effective in preventing sulfur dioxide emissions to the atmosphere as restricting the H_2 concentration in the fuel gas to 230 mg/dscm or less. The combustion in a flare of process upset gas, or fuel gas which is released to the flare as a result of relief valve leakage, is exempt from this paragraph.

(2) Discharge or cause the discharge of any gases into the atmosphere from any Claus sulfur recovery plant containing in excess of:

(i) 0.025 percent by volume of sulfur dioxide at zero percent oxygen on a dry basis if emissions are controlled by an oxidation control system, or a reduction control system followed by incineration, or

(ii) 0.030 percent by volume of reduced sulfur compounds and 0.0010 percent by volume of hydrogen sulfide

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calculated as sulfur dioxide at zero percent oxygen on a dry basis if emissions are controlled by a reduction control system not followed by incineration.

(Sec. 114, Clean Air Act, as amended (42 U.S.C. 7414))

[43 FR 10869, Mar. 15, 1978]

§ 60.105 Emission monitoring.

(a) Continuous monitoring systems shall be installed, calibrated, maintained, and operated by the owner or operator as follows:

(1) A continuous monitoring system for the measurement of the opacity of emissions discharged into the atmosphere from the fluid catalytic cracking unit catalyst regenerator. The continuous monitoring system shall be spanned at 60, 70, or 80 percent opacity.

(2) An instrument for continuously monitoring and recording the concentration of carbon monoxide in gases discharged into the atmosphere from fluid catalytic cracking unit catalyst regenerators. The span of this continuous monitoring system shall be 1,000 ppm.

(3) A continuous monitoring system for the measurement of sulfur dioxide in the gases discharged into the atmosphere from the combustion of fuel gases (except where a continuous monitoring system for the measurement of hydrogen sulfide is installed under paragraph (a) (4) of this section). The pollutant gas used to prepare calibration gas mixtures under paragraph 2.1, Performance Specification 2 and for calibration checks under § 60.13(d), shall be sulfur dioxide (SO_2). The span shall be set at 100 ppm. For conducting monitoring system performance evaluations under § 60.13(c), Reference Method 6 shall be used.

(4) An instrument for continuously monitoring and recording concentrations of hydrogen sulfide in fuel gases burned in any fuel gas combustion device, if compliance with § 60.104(a)(1) is achieved by removing H_2S from the fuel gas before it is burned; fuel gas combustion devices having a common source of fuel gas may be monitored at one location, if monitoring at this location accurately represents the concentration of H_2S in the fuel gas burned. The span of this continuous monitoring system shall be 300 ppm.

(5) An instrument for continuously monitoring and recording concentrations of SO_2 in the gases discharged into the atmosphere from any Claus sulfur recovery plant if compliance with § 60.104(a)(2) is achieved through the use of an oxidation control system or a reduction control system followed by incineration. The span of this continuous monitoring system shall be sent at 500 ppm.

(6) An instrument(s) for continuously monitoring and recording the concentration of H_2S and reduced sulfur compounds in the gases discharged into the atmosphere from any Claus sulfur recovery plant if compliance with § 60.104(a)(2) is achieved through the use of a reduction control system not followed by incineration. The span(s) of this continuous monotoring system(s) shall be set at 20 ppm for monitoring and recording the concentration of H_2S and 600 ppm for monitoring and recording the concentration of reduced sulfur compounds.

(b) [Reserved]

(c) The average coke burn-off rate (thousands of kilogram/hr) and hours of operation for any fluid catalytic cracking unit catalyst regenerator subject to § 60.102 or § 60.103 shall be recorded daily.

(d) For any fluid catalytic cracking unit catalyst regenerator which is subject to § 60.102 and which utilizes an incinerator-waste heat boiler to combust the exhaust gases from the catalyst regenerator, the owner or operator shall record daily the rate of combustion of liquid or solid fossil fuels (liters/hr or kilograms/hr) and the hours of operation during which liquid or solid fossil fuels are combusted in the incinerator-waste heat boiler.

(e) For the purpose of reports under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) Opacity. All one-hour periods which contain two or more six-minute periods during which the average opacity as measured by the continuous monitoring system exceeds 30 percent.

(2) Carbon monoxide. All hourly periods during which the average carbon

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monoxide concentration in the gases discharged into the atmosphere from any fluid catalytic cracking unit catalyst regenerator subject to § 60.103 exceeds 0.050 percent by volume.

(3) Sulfur dioxide. (i) Any three-hour period during which the average concentration of H_2S in any fuel gas combusted in any fuel gas combustion device subject to § 60.104(a)(1) exceeds 230 mg/dscm (0.10 gr/dscf), if compliance is achieved by removing H_2S from the fuel gas before it is burned; or any three-hour period during which the average concentration of SO_2 in the gases discharged into the atmosphere from any fuel gas combustion device subject to § 60.104(a)(1) exceeds the level specified in § 60.104(a)(1), if compliance is achieved by removing SO_2 from the combusted fuel gases.

(ii) Any twelve-hour period during which the average concentration of SO_2 in the gases discharged into the atmosphere from any Claus sulfur recovery plant subject to § 60.104(a)(2) exceeds 250 ppm at zero percent oxygen on a dry basis if compliance with § 60.104(b) is achieved through the use of an oxidation control system or a reduction control system followed by incineration; or any twelve-hour period during which the average concentration of H_2S, or reduced sulfur compounds in the gases discharged into the atmosphere of any Claus sulfur plant subject to § 60.104(a)(2)(b) exceeds 10 ppm or 300 ppm, respectively, at zero percent oxygen and on a dry basis if compliance is achieved through the use of a reduction control system not followed by incineration.

(4) Any six-hour period during which the average emissions (arithmetic average of six contiguous one-hour periods) of sulfur dioxide as measured by a continuous monitoring system exceed the standard under § 60.104.

(Sec. 114, Clean Air Act, as amended (42 U.S.C. 7414))

[39 FR 9315, Mar. 8, 1974, as amended at 40 FR 46259, Oct. 6, 1975; 42 FR 32427, June 24, 1977; 42 FR 39389, Aug. 4, 1977; 43 FR 8800, Mar. 3, 1978; 43 FR 10869, Mar. 15, 1978]

§ 60.106 Test methods and procedures.

(a) For the purpose of determining compliance with § 60.102(a)(1), the following reference methods and calculation procedures shall be used:

(1) For gases released to the atmosphere from the fluid catalytic cracking unit catalyst regenerator:

(i) Method 5 for the concentration of particulate matter and moisture content,

(ii) Method 1 for sample and velocity traverses, and

(iii) Method 2 for velocity and volumetric flow rate.

(2) For Method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.015 dscm/min (0.53 dscf/min), except that shorter sampling times may be approved by the Administrator when process variables or other factors preclude sampling for at least 60 minutes.

(3) For exhaust gases from the fluid catalytic cracking unit catalyst regenerator prior to the emission control system: the integrated sample techniques of Method 3 and Method 4 for gas analysis and moisture content, respectively; Method 1 for velocity traverses; and Method 2 for velocity and volumetric flow rate.

(4) Coke burn-off rate shall be determined by the following formula:

$$R_c = 0.2982\ Q_{RE}\ (\%CO_2 + \%CO) + 2.088\ Q_{RA} - [0.0994\ Q_{RE}\ [\%CO/2 + \%CO_2 + \%O_2]$$ (Metric Units) or

$$R_c = 0.0186\ Q_{RE}\ (\%CO_2 + \%CO) + 0.1303\ Q_{RA} - 0.0062\ Q_{RE}\ [\%CO/2 + \%CO_2 + \%O_2]$$ (English Units)

where:

R_c = coke burn-off rate, kg/hr (English units: lb/hr).

0.2982 = metric units material balance factor divided by 100, kg-min/hr-m^3.

0.0186 = English units material balance factor divided by 100, lb-min/hr-ft^3.

Q_{RE} = fluid catalytic cracking unit catalyst regenerator exhaust gas flow rate before entering the emission control system, as determined by method 2, dscm/min (English units: dscf/min).

$\%CO_2$ = percent carbon dioxide by volume, dry basis, as determined by Method 3.

%CO = percent carbon monoxide by volume, dry basis, as determined by Method 3.

$\%O_2$ = percent oxygen by volume, dry basis, as determined by Method 3.

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2.088 = metric units material balance factor divided by 100, kg-min/hr-m³.
0.1303 = English units material balance factor divided by 100, lb-min/hr-ft³.
Q_{RA} = air rate to fluid catalytic cracking unit catalyst regenerator, as determined from fluid catalytic cracking unit control room instrumentation, dscm/min (English units: dscf/min).
0.0994 = metric units material balance factor divided by 100, kg-min/hr-m³.
0.0062 = English units material balance factor divided by 100, lb-min/hr-ft³.

(5) Particulate emissions shall be determined by the following equation:

$$R_E = (60 \times 10^{-6}) Q_{RV} C_s \text{ (Metric Units)}$$

or

$$R_E = (8.57 \times 10^{-3}) Q_{RV} C_s \text{ (English Units)}$$

where:

R_E = particulate emission rate, kg/hr (English units: lb/hr).
60×10^{-6} = metric units conversion factor, min-kg/hr-mg.
8.57×10^{-3} = English units conversion factor, min-lb/hr-gr.
Q_{RV} = volumetric flow rate of gases discharged into the atmosphere from the fluid catalytic cracking unit catalyst regenerator following the emission control system, as determined by Method 2, dscm/min (English units: dscf/min).
C_s = particulate emission concentration discharged into the atmosphere, as determined by Method 5, mg/dscm (English units: gr/dscf).

(6) For each run, emissions expressed in kg/1000 kg (English units: lb/1000 lb) of coke burn-off in the catalyst regenerator shall be determined by the following equation:

$$R_s = 1000(R_E/R_c) \text{ (Metric or English Units)}$$

where:

R_s = particulate emission rate, kg/1000 kg (English units: lb/1000 lb) of coke burn-off in the fluid catalytic cracking unit catalyst regenerator.
1000 = conversion factor, kg to 1000 kg (English units: lb to 1000 lb).
R_E = particulate emission rate, kg/hr (English units: lb/hr).
R_c = coke burn-off rate, kg/hr (English units: lb/hr).

(7) In those instances in which auxiliary liquid or solid fossil fuels are burned in an incinerator-waste heat boiler, the rate of particulate matter emissions permitted under § 60.102(b) must be determined. Auxiliary fuel heat input, expressed in millions of cal/hr (English units: Millions of Btu/hr) shall be calculated for each run by fuel flow rate measurement and analysis of the liquid or solid auxiliary fossil fuels. For each run, the rate of particulate emissions permitted under § 60.102(b) shall be calculated from the following equation:

$$R_s = 1.0 + (0.18\ H/R_c) \text{ (Metric Units)}$$

or

$$R_s = 1.0 + (0.10\ H/R_c) \text{ (English Units)}$$

where:

R_s = allowable particulate emission rate, kg/1000 kg (English units: lb/1000 lb) of coke burn-off in the fluid catalytic cracking unit catalyst regenerator.
1.0 = emission standard, 1.0 kg/1000 kg (English units: 1.0 lb/1000 lb) of coke burn-off in the fluid catalytic cracking unit catalyst regenerator.
0.18 = metric units maximum allowable incremental rate of particulate emissions, g/million cal.
0.10 = English units maximum allowable incremental rate of particulate emissions, lb/million Btu.
H = heat input from solid or liquid fossil fuel, million cal/hr (English units: million Btu/hr).
R_c = coke burn-off rate, kg/hr (English units: lb/hr).

(b) For the purpose of determining compliance with § 60.103, the integrated sample technique of Method 10 shall be used. The sample shall be extracted at a rate proportional to the gas velocity at a sampling point near the centroid of the duct. The sampling time shall not be less than 60 minutes.

(c) For the purpose of determining compliance with § 60.104(a)(1), Method 11 shall be used to determine the concentration of H_2S and Method 6 shall be used to determine the concentration of SO_2.

(1) If Method 11 is used, the gases sampled shall be introduced into the sampling train at approximately atmospheric pressure. Where refinery fuel gas lines are operating at pressures substantially above atmosphere, this may be accomplished with a flow control valve. If the line pressure is high enough to operate the sampling train without a vacuum pump, the pump may be eliminated from the sampling train. The sample shall be drawn from a point near the centroid of the fuel gas line. The minimum

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sampling time shall be 10 minutes and the minimum sampling volume 0.01 dscm (0.35 dscf) for each sample. The arithmetic average of two samples of equal sampling time shall constitute one run. Samples shall be taken at approximately 1-hour intervals. For most fuel gases, sample times exceeding 20 minutes may result in depletion of the collecting solution, although fuel gases containing low concentrations of hydrogen sulfide may necessitate sampling for longer periods of time.

(2) If Method 6 is used, Method 1 shall be used for velocity traverses and Method 2 for determining velocity and volumetric flow rate. The sampling site for determining SO_2 concentration by Method 6 shall be the same as for determining volumetric flow rate by Method 2. The sampling point in the duct for determining SO_2 concentration by Method 6 shall be at the centroid of the cross section if the cross sectional area is less than 5 m^2 (54 ft^2) or at a point no closer to the walls than 1 m (39 inches) if the cross sectional area is 5 m^2 or more and the centroid is more than one meter from the wall. The sample shall be extracted at a rate proportional to the gas velocity at the sampling point. The minimum sampling time shall be 10 minutes and the minimum sampling volume 0.01 dscm (0.35 dscf) for each sample. The arithmetic average of two samples of equal sampling time shall constitute one run. Samples shall be taken at approximately 1-hour intervals.

(d) For the purpose of determining compliance with § 60.104(a)(2), Method 6 shall be used to determine the concentration of SO_2 and Method 15 shall be used to determine the concentation of H_2S and reduced sulfur compounds.

(1) If Method 6 is used, the procedure outlined in paragraph (c)(2) of this section shall be followed except that each run shall span a minimum of four consecutive hours of continuous sampling. A number of separate samples may be taken for each run, provided the total sampling time of these samples adds up to a minimum of four consecutive hours. Where more than one sample is used, the average SO_2 concentration for the run shall be calculated as the time weighted average of the SO_2 concentration for each sample according to the formula:

$$C_R = \sum_{i=1}^{N} C_{s_i} \frac{t_{s_i}}{T}$$

where:

C_R = SO_2 concentration for the run.
N = Number of samples.
C_{Si} = SO_2 concentration for sample i.
t_{Si} = Continuous sampling time of sample i.
T = Total continuous sampling time of all N samples.

(2) If Method 15 is used, each run shall consist of 16 samples taken over a minimum of three hours. The sampling point shall be at the centroid of the cross section of the duct if the cross sectional area is less than 5 m^2 (54 ft^2) or at a point no closer to the walls than 1 m (39 inches) if the cross sectional area is 5 m^2 or more and the centroid is more than 1 meter from the wall. To insure minimum residence time for the sample inside the sample lines, the sampling rate shall be at least 3 liters/minute (0.1 ft^3/min). The SO_2 equivalent for each run shall be calculated as the arithmetic average of the SO_2 equivalent of each sample during the run. Reference Method 4 shall be used to determine the moisture content of the gases. The dampling point for Method 4 shall be adjacent to the sampling point for Method 15. The sample shall be extracted at a rate proportional to the gas velocity at the sampling point. Each run shall span a minimum of four consecutive hours of continuous sampling. A number of separarte samples may be taken for each run provided the total sampling time of these samples adds up to a minimum of four consecutive hours. Where more than one sample is used, the average moisture content for the run shall be calculated as the time weighted average of the moisture content of each sample according to the formula:

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$$B_{wo} = \sum_{i=1}^{N} B_{wi}\left[\frac{t_i}{T}\right]$$

where:

B_{wo} = Proportion by volume of water vapor in the gas stream for the run.

N = Number of samples.

B_{wi} = Proportion by volume of water vapor in the gas stream for the sample i.

t_i = Continuous sampling time for sample i.

T = Total continuous sampling time of all N samples.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9315, Mar. 8, 1974, as amended at 42 FR 32427, June 24, 1977; 43 FR 8800, Mar. 3, 1978; 43 FR 10869, Mar. 15, 1978]

Subpart K—Standards of Performance for Storage Vessels for Petroleum Liquids Constructed After June 11, 1973 and Prior to May 19, 1978

§ 60.110 Applicability and designation of affected facility.

(a) Except as provided in § 60.110(b), the affected facility to which this subpart applies is each storage vessel for petroleum liquids which has a storage capacity greater than 151,412 liters (40,000 gallons).

(b) This subpart does not apply to storage vessels for petroleum or condensate stored, processed, and/or treated at a drilling and production facility prior to custody transfer.

(c) Subject to the requirements of this subpart is any facility under paragraph (a) of this section which:

(1) Has a capacity greater than 151,416 liters (40,000 gallons), but not exceeding 246,052 liters (65,000 gallons), and commences construction or modification after March 8, 1974, and prior to May 19, 1978.

(2) Has a capacity greater than 246,052 liters (65,000 gallons) and commences construction or modification after June 11, 1973, and prior to May 19, 1978.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977, as amended at 45 FR 23379, Apr. 4, 1980]

§ 60.111 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Storage vessel" means any tank, reservoir, or container used for the storage of petroleum liquids, but does not include:

(1) Pressure vessels which are designed to operate in excess of 15 pounds per square inch gauge without emissions to the atmosphere except under emergency conditions,

(2) Subsurface caverns or porous rock reservoirs, or

(3) Underground tanks if the total volume of petroleum liquids added to and taken from a tank annually does not exceed twice the volume of the tank.

(b) "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean Nos. 2 through 6 fuel oils as specified in ASTM-D-396-78, gas turbine fuel oils Nos. 2-GT through 4-GT as specified in ASTM-D-2880-78, or diesel fuel oils Nos. 2-D and 4-D as specified in ASTM-D-97578.

(c) "Petroleum refinery" means each facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, extracting, or reforming of unfinished petroleum derivatives.

(d) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.

(e) "Hydrocarbon" means any organic compound consisting predominantly of carbon and hydrogen.

(f) "Condensate" means hydrocarbon liquid separated from natural gas which condenses due to changes in the temperature and/or pressure and remains liquid at standard conditions.

(g) "Custody transfer" means the transfer of produced petroleum and/or condensate, after processing and/or treating in the producing operations, from storage tanks or automatic trans-

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fer facilities to pipelines or any other forms of transportation.

(h) "Drilling and production facility" means all drilling and servicing equipment, wells, flow lines, separators, equipment, gathering lines, and auxiliary nontransportation-related equipment used in the production of petroleum but does not include natural gasoline plants.

(i) "True vapor pressure" means the equilibrium partial pressure exerted by a petroleum liquid as determined in accordance with methods described in American Petroleum Institute Bulletin 2517, Evaporation Loss from Floating Roof Tanks, 1962.

(j) "Floating roof" means a storage vessel cover consisting of a double deck, pontoon single deck, internal floating cover or covered floating roof, which rests upon and is supported by the petroleum liquid being contained, and is equipped with a closure seal or seals to close the space between the roof edge and tank wall.

(k) "Vapor recovery system" means a vapor gathering system capable of collecting all hydrocarbon vapors and gases discharged from the storage vessel and a vapor disposal system capable of processing such hydrocarbon vapors and gases so as to prevent their emission to the atmosphere.

(l) "Reid vapor pressure" is the absolute vapor pressure of volatile crude oil and volatile non-viscous petroleum liquids, except liquified petroleum gases, as determined by ASTM-D-323-58 (reapproved 1968).

[39 FR 9317, Mar. 8, 1974; 39 FR 13776, Apr. 17, 1974, as amended at 39 FR 20794, June 14, 1974; 45 FR 23379, Apr. 4, 1980]

§ 60.112 Standard for volatile organic compounds (VOC).

(a) The owner or operator of any storage vessel to which this subpart applies shall store petroleum liquids as follows:

(1) If the true vapor pressure of the petroleum liquid, as stored, is equal to or greater than 78 mm Hg (1.5 psia) but not greater than 570 mm Hg (11.1 psia), the storage vessel shall be equipped with a floating roof, a vapor recovery system, or their equivalents.

(2) If the true vapor pressure of the petroleum liquid as stored is greater than 570 mm Hg (11.1 psia), the storage vessel shall be equipped with a vapor recovery system or its equivalent.

[39 FR 9317, Mar. 8, 1974; 39 FR 13776, Apr. 17, 1974, as amended at 45 FR 23379, Apr. 4, 1980]

§ 60.113 Monitoring of operations.

(a) Except as provided in paragraph (d) of this section, the owner or operator subject to this subpart shall maintain a record of the petroleum liquid stored, the period of storage, and the maximum true vapor pressure of that liquid during the respective storage period.

(b) Available data on the typical Reid vapor pressure and the maximum expected storage temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in API Bulletin 2517, unless the Administrator specifically requests that the liquid be sampled, the actual storage temperature determined, and the Reid vapor pressure determined from the sample(s).

(c) The true vapor pressure of each type of crude oil with a Reid vapor pressure less than 13.8 kPa (2.0 psia) or whose physical properties preclude determination by the recommended method is to be determined from available data and recorded if the estimated true vapor pressure is greater than 6.9 kPa (1.0 psia).

(d) The following are exempt from the requirements of this section:

(1) Each owner or operator of each affected facility which stores petroleum liquids with a Reid vapor pressure of less than 6.9 kPa (1.0 psia) provided the maximum true vapor pressure does not exceed 6.9 kPa (1.0 psia).

(2) Each owner or operator of each affected facility equipped with a vapor recovery and return or disposal system in accordance with the requirements of § 60.112.

[45 FR 23379, Apr. 4, 1980]

Subpart Ka—Standards of Performance for Storage Vessels for Petroleum Liquids Constructed After May 18, 1978

SOURCE: 45 FR 23379, Apr. 4, 1980, unless otherwise noted.

§ 60.110a Applicability and designation of affected facility.

(a) Except as provided in paragraph (b) of this section, the affected facility to which this subpart applies is each storage vessel for petroleum liquids which has a storage capacity greater than 151,416 liters (40,000 gallons) and for which construction is commenced after May 18, 1978.

(b) Each petroleum liquid storage vessel with a capacity of less than 1,589,873 liters (420,000 gallons) used for petroleum or condensate stored, processed, or treated prior to custody transfer is not an affected facility and, therefore, is exempt from the requirements of this subpart.

§ 60.111a Definitions.

In addition to the terms and their definitions listed in the Act and Subpart A of this part the following definitions apply in this subpart:

(a) "Storage vessel" means each tank, reservoir, or container used for the storage of petroleum liquids, but does not include:

(1) Pressure vessels which are designed to operate in excess of 204.9 kPa (15 psig) without emissions to the atmosphere except under emergency conditions.

(2) Subsurface caverns or porous rock reservoirs, or

(3) Underground tanks if the total volume of petroleum liquids added to and taken from a tank annually does not exceed twice the volume of the tank.

(b) "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean Nos. 2 through 6 fuel oils as specified in ASTM-D-396-78, gas turbine fuel oils Nos. 2-GT through 4-GT as specified in ASTM-D-2880-78, or diesel fuel oils Nos. 2-D and 4-D as specified in ASTM-D-975-78.

(c) "Petroleum refinery" means each facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, extracting, or reforming of unfinished petroleum derivatives.

(d) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.

(e) "Condensate" means hydrocarbon liquid separated from natural gas which condenses due to changes in the temperature or pressure, or both, and remains liquid at standard conditions.

(f) "True vapor pressure" means the equilibrium partial pressure exerted by a petroleum liquid such as determined in accordance with methods described in American Petroleum Institute Bulletin 2517, Evaporation Loss from Floating Roof Tanks, 1962.

(g) "Reid vapor pressure" is the absolute vapor pressure of volatile crude oil and volatile non-viscous petroleum liquids, except liquified petroleum gases, as determined by ASTM-D-323-58 (reapproved 1968).

(h) "Liquid-mounted seal" means a foam or liquid-filled primary seal mounted in contact with the liquid between the tank wall and the floating roof continuously around the circumference of the tank.

(i) "Metallic shoe seal" includes but is not limited to a metal sheet held vertically against the tank wall by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annular space between the metal sheet and the floating roof.

(j) "Vapor-mounted seal" means a foam-filled primary seal mounted continuously around the circumference of the tank so there is an annular vapor space underneath the seal. The annular vapor space is bounded by the bottom of the primary seal, the tank wall, the liquid surface, and the floating roof.

(k) "Custody transfer" means the transfer of produced petroleum and/or condensate, after processing and/or treating in the producing operations, from storage tanks or automatic transfer facilities to pipelines or any other forms of transportation.

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§ 60.112a Standard for volatile organic compounds (VOC).

(a) The owner or operator of each storage vessel to which this subpart applies which contains a petroleum liquid which, as stored, has a true vapor pressure equal to or greater than 10.3 kPa (1.5 psia) but not greater than 76.6 kPa (11.1 psia) shall equip the storage vessel with one of the following:

(1) An external floating roof, consisting of a pontoon-type or double-deck-type cover that rests on the surface of the liquid contents and is equipped with a closure device between the tank wall and the roof edge. Except as provided in paragraph (a)(1)(ii)(D) of this section, the closure device is to consist of two seals, one above the other. The lower seal is referred to as the primary seal and the upper seal is referred to as the secondary seal. The roof is to be floating on the liquid at all times (i.e., off the roof leg supports) except during initial fill and when the tank is completely emptied and subsequently refilled. The process of emptying and refilling when the roof is resting on the leg supports shall be continuous and shall be accomplished as rapidly as possible.

(i) The primary seal is to be either a metallic shoe seal, a liquid-mounted seal, or a vapor-mounted seal. Each seal is to meet the following requirements:

(A) The accumulated area of gaps between the tank wall and the metallic shoe seal or the liquid-mounted seal shall not exceed 212 cm^2 per meter of tank diameter (10.0 in^2 per ft of tank diameter) and the width of any portion of any gap shall not exceed 3.81 cm (1½ in).

(B) The accumulated area of gaps between the tank wall and the vapor-mounted seal shall not exceed 21.2 cm^2 per meter of tank diameter (1.0 in^2 per ft of tank diameter) and the width of any portion of any gap shall not exceed 1.27 cm (½ in).

(C) One end of the metallic shoe is to extend into the stored liquid and the other end is to extend a minimum vertical distance of 61 cm (24 in) above the stored liquid surface.

(D) There are to be no holes, tears, or other openings in the shoe, seal fabric, or seal envelope.

(ii) The secondary seal is to meet the following requirements:

(A) The secondary seal is to be installed above the primary seal so that it completely covers the space between the roof edge and the tank wall except as provided in paragraph (a)(1)(ii)(B) of this section.

(B) The accumulated area of gaps between the tank wall and the secondary seal used in combination with a metallic shoe or liquid-mounted primary seal shall not exceed 21.2 cm^2 per meter of tank diameter (1.0 in^2 per ft. of tank diameter) and the width of any portion of any gap shall not exceed 1.27 cm (½ in.). There shall be no gaps between the tank wall and the secondary seal used in combination with a vapor-mounted primary seal.

(C) There are to be no holes, tears or other openings in the seal or seal fabric.

(D) The owner or operator is exempted from the requirements for secondary seals and the secondary seal gap criteria when performing gap measurements or inspections of the primary seal.

(iii) Each opening in the roof except for automatic bleeder vents and rim space vents is to provide a projection below the liquid surface. Each opening in the roof except for automatic bleeder vents, rim space vents and leg sleeves is to be equipped with a cover, seal or lid which is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use or as described in pargraph (a)(1)(iv) of this section. Automatic bleeder vents are to be closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the roof leg supports. Rim vents are to be set to open when the roof is being floated off the roof legs supports or at the manufacturer's recommended setting.

(iv) Each emergency roof drain is to be provided with a slotted membrane fabric cover that covers at least 90 percent of the area of the opening.

(2) A fixed roof with an internal floating type cover equipped with a continuous closure device between the

tank wall and the cover edge. The cover is to be floating at all times, (i.e., off the leg supports) except during initial fill and when the tank is completely emptied and subsequently refilled. The process of emptying and refilling when the cover is resting on the leg supports shall be continuous and shall be accomplished as rapidly as possible. Each opening in the cover except for automatic bleeder vents and the rim space vents is to provide a projection below the liquid surface. Each opening in the cover except for automatic bleeder vents, rim space vents, stub drains and leg sleeves is to be equipped with a cover, seal, or lid which is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use. Automatic bleeder vents are to be closed at all times when the cover is floating except when the cover is being floated off or is being landed on the leg supports. Rim vents are to be set to open only when the cover is being floated off the leg supports or at the manufacturer's recommended setting.

(3) A vapor recovery system which collects all VOC vapors and gases discharged from the storage vessel, and a vapor return or disposal system which is designed to process such VOC vapors and gases so as to reduce their emission to the atmosphere by at least 95 percent by weight.

(4) A system equivalent to those described in paragraphs (a)(1), (a)(2), or (a)(3) of this section as provided in § 60.114a.

(b) The owner or operator of each storage vessel to which this subpart applies which contains a petroleum liquid which, as stored, has a true vapor pressure greater than 76.6 kPa (11.1 psia), shall equip the storage vessel with a vapor recovery system which collects all VOC vapors and gases discharged from the storage vessel, and a vapor return or disposal system which is designed to process such VOC vapors and gases so as to reduce their emission to the atmosphere by at least 95 percent by weight.

[45 FR 23379, Apr. 4, 1980, as amended at 45 FR 83229, Dec. 18, 1980]

§ 60.113a Testing and procedures.

(a) Except as provided in § 60.8(b) compliance with the standard prescribed in § 60.112a shall be determined as follows or in accordance with an equivalent procedure as provided in § 60.114a.

(1) The owner or operator of each storage vessel to which this subpart applies which has an external floating roof shall meet the following requirements:

(i) Determine the gap areas and maximum gap widths between the primary seal and the tank wall, and the secondary seal and the tank wall according to the following frequency and furnish the Administrator with a written report of the results within 60 days of performance of gap measurements:

(A) For primary seals, gap measurements shall be performed within 60 days of the initial fill with petroleum liquid and at least once every five years thereafter. All primary seal inspections or gap measurements which require the removal or dislodging of the secondary seal shall be accomplished as rapidly as possible and the secondary seal shall be replaced as soon as possible.

(B) For secondary seals, gap measurements shall be performed within 60 days of the initial fill with petroleum liquid and at least once every year thereafter.

(C) If any storage vessel is out of service for a period of one year or more, subsequent refilling with petroleum liquid shall be considered initial fill for the purposes of paragraphs (a)(1)(i)(A) and (a)(1)(i)((B) of this section.

(ii) Determine gap widths in the primary and secondary seals individually by the following procedures:

(A) Measure seal gaps, if any, at one or more floating roof levels when the roof is floating off the roof leg supports.

(B) Measure seal gaps around the entire circumference of the tank in each place where a ½" diameter uniform probe passes freely (without forcing or binding against seal) between the seal and the tank wall and

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measure the circumferential distance of each such location.

(C) The total surface area of each gap described in paragraph (a)(1)(ii)(B) of this section shall be determined by using probes of various widths to accurately measure the actual distance from the tank wall to the seal and multiplying each such width by its respective circumferential distance.

(iii) Add the gap surface area of each gap location for the primary seal and the secondary seal individually. Divide the sum for each seal by the nominal diameter of the tank and compare each ratio to the appropriate ratio in the standard in § 60.112a(a)(1)(i) and § 60.112a(a)(1)(ii).

(iv) Provide the Administrator 30 days prior notice of the gap measurement to afford the Administrator the opportunity to have an observer present.

(2) The owner or operator of each storage vessel to which this subpart applies which has a vapor recovery and return or disposal system shall provide the following information to the Administrator on or before the date on which construction of the storage vessel commences:

(i) Emission data, if available, for a similar vapor recovery and return or disposal system used on the same type of storage vessel, which can be used to determine the efficiency of the system. A complete description of the emission measurement method used must be included.

(ii) The manufacturer's design specifications and estimated emission reduction capability of the system.

(iii) The operation and maintenance plan for the system.

(iv) Any other information which will be useful to the Administrator in evaluating the effectiveness of the system in reducing VOC emissions.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

§ 60.114a Equivalent equipment and procedures.

(a) Upon written application from an owner or operator and after notice and opportunity for public hearing, the Administrator may approve the use of equipment or procedures, or both, which have been demonstrated to his satisfaction to be equivalent in terms of reduced VOC emissions to the atmosphere to the degree prescribed for compliance with a specific paragraph(s) of this subpart.

(b) The owner or operator shall provide the following information in the application for determination of equivalency:

(1) Emission data, if available, which can be used to determine the effectiveness of the equipment or procedures in reducing VOC emissions from the storage vessel. A complete description of the emission measurement method used must be included.

(2) The manufacturer's design specifications and estimated emission reduction capability of the equipment.

(3) The operation and maintenance plan for the equipment.

(4) Any other information which will be useful to the Administrator in evaluating the effectiveness of the equipment or procedures in reducing VOC emissions.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.115a Monitoring of operations.

(a) Except as provided in paragraph (d) of this section, the owner or operator subject to this subpart shall maintain a record of the petroleum liquid stored, the period of storage, and the maximum true vapor pressure of that liquid during the respective storage period.

(b) Available data on the typical Reid vapor pressure and the maximum expected storage temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in API Bulletin 2517, unless the Administrator specifically requests that the liquid be sampled, the actual storage temperature determined, and the Reid vapor pressure determined from the sample(s).

(c) The true vapor pressure of each type of crude oil with a Reid vapor pressure less than 13.8 kPa (2.0 psia) or whose physical properties preclude determination by the recommended method is to be determined from available data and recorded if the estimat-

ed true vapor pressure is greater than 6.9 kPa (1.0 psia).

(d) The following are exempt from the requirements of this section:

(1) Each owner or operator of each storage vessel storing a petroleum liquid with a Reid vapor pressure of less than 6.9 kPa (1.0 psia) provided the maximum true vapor pressure does not exceed 6.9 kPa (1.0 psia).

(2) Each owner or operator of each storage vessel equipped with a vapor recovery and return or disposal system in accordance with the requirements of §§ 60.112a(a)(3) and 60.112a(b).

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

Subpart L—Standards of Performance for Secondary Lead Smelters

§ 60.120 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in secondary lead smelters: Pot furnaces of more than 250 kg (550 lb) charging capacity, blast (cupola) furnaces, and reverberatory furnaces.

(b) Any facility under paragraph (a) of this section that commences construction or modification after June 11, 1973, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.121 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Reverberatory furnace" includes the following types of reverberatory furnaces: stationary, rotating, rocking, and tilting.

(b) "Secondary lead smelter" means any facility producing lead from a leadbearing scrap material by smelting to the metallic form.

(c) "Lead" means elemental lead or alloys in which the predominant component is lead.

[39 FR 9317, Mar. 8, 1974; 39 FR 13776, Apr. 17, 1974]

§ 60.122 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from a blast (cupola) or reverberatory furnace any gases which:

(1) Contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

(2) Exhibit 20 percent opacity or greater.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any pot furnace any gases which exhibit 10 percent opacity or greater.

[39 FR 9317, Mar. 8, 1974, as amended at 40 FR 46259, Oct. 6, 1975]

§ 60.123 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8 (b), shall be used to determine compliance with the standards prescribed in § 60.122 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.9 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necesitated by process variables or other factors, may be approved by the Administrator. Particulate sampling shall be conducted during representative periods of furnace operation, including charging and tapping.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9317, Mar. 8, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

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Subpart M—Standards of Performance for Secondary Brass and Bronze Ingot Production Plants

§ 60.130 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in secondary brass or bronze ingot production plants: Reverberatory and electric furnaces of 1,000 kg (2,205 lb) or greater production capacity and blast (cupola) furnaces of 250 kg/hr (550 lb/hr) or greater production capacity.

(b) Any facility under paragraph (a) of this section that commences construction or modification after June 11, 1973, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.131 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Brass or bronze" means any metal alloy containing copper as its predominant constituent, and lesser amounts of zinc, tin, lead, or other metals.

(b) "Reverberatory furnace" includes the following types of reverberatory furnaces: Stationary, rotating, rocking, and tilting.

(c) "Electric furnace" means any furnace which uses electricity to produce over 50 percent of the heat required in the production of refined brass or bronze.

(d) "Blast furnace" means any furnace used to recover metal from slag.

[39 FR 9318, Mar. 8, 1974]

§ 60.132 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from a reverberatory furnace any gases which:

(1) Contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

(2) Exhibit 20 percent opacity or greater.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any blast (cupola) or electric furnace any gases which exhibit 10 percent opacity or greater.

[39 FR 9318, Mar. 8, 1974, as amended at 40 FR 46259, Oct. 6, 1975]

§ 60.133 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.132 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content.

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least 120 minutes and the sampling rate shall be at least 0.9 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator. Particulate matter sampling shall be conducted during representative periods of charging and refining, but not during pouring of the heat.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9318, Mar. 8, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart N—Standards of Performance for Iron and Steel Plants

§ 60.140 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each basic oxygen process furnace.

(b) Any facility under paragraph (a) of this section that commences con-

struction or modification after June 11, 1973, is subject to the requirements of this subpart.

(Sec. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.141 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Basic oxygen process furnace" (BOPF) means any furnace producing steel by charging scrap steel, hot metal, and flux materials into a vessel and introducing a high volume of an oxygen-rich gas.

(b) "Steel production cycle" means the operations required to produce each batch of steel and includes the following major functions: Scrap charging, preheating (when used), hot metal charging, primary oxygen blowing, additional oxygen blowing (when used), and tapping.

(c) "Startup" means the setting into operation for the first steel production cycle of a relined BOPF or a BOPF which has been out of production for a minimum continuous time period of eight hours.

[39 FR 9318, Mar. 8, 1974, as amended at 43 FR 15602, Apr. 13, 1978]

§ 60.142 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

(2) Exit from a control device and exhibit 10 percent opacity or greater, except that an opacity of greater than 10 percent but less than 20 percent may occur once per steel production cycle.

[39 FR 9318, Mar. 8, 1974, as amended at 43 FR 15602, Apr. 13, 1978]

§ 60.143 Monitoring of operations.

(a) The owner or operator of an affected facility shall maintain a single time-measuring instrument which shall be used in recording daily the time and duration of each steel production cycle, and the time and duration of any diversion of exhaust gases from the main stack servicing the BOPF.

(b) The owner or operator of any affected facility that uses venturi scrubber emission control equipment shall install, calibrate, maintain, and continuously operate monitoring devices as follows:

(1) A monitoring device for the continuous measurement of the pressure loss through the venturi constriction of the control equipment. The monitoring device is to be certified by the manufacturer to be accurate within ±250 Pa (±1 inch water).

(2) A monitoring device for the continuous measurement of the water supply pressure to the control equipment. The monitoring device is to be certified by the manufacturer to be accurate within ±5 percent of the design water supply pressure. The monitoring device's pressure sensor or pressure tap must be located close to the water discharge point. The Administrator may be consulted for approval of alternative locations for the pressure sensor or tap.

(3) All monitoring devices shall be synchronized each day with the time-measuring instrument used under paragraph (a) of this section. The chart recorder error directly after synchronization shall not exceed 0.08 cm (1/32 inch).

(4) All monitoring devices shall use chart recorders which are operated at a minimum chart speed of 3.8 cm/hr (1.5 in/hr).

(5) All monitoring devices are to be recalibrated annually, and at other times as the Administrator may require, in accordance with the procedures under § 60.13(b)(3).

(c) Any owner or operator subject to requirements under paragraph (b) of this section shall report for each calendar quarter all measurements over any three-hour period that average more than 10 percent below the aver-

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age levels maintained during the most recent performance test conducted under § 60.8 in which the affected facility demonstrated compliance with the standard under § 60.142(a)(1). The accuracy of the respective measurements, not to exceed the values specified in paragraphs (b)(1) and (b)(2) of this section, may be taken into consideration when determining the measurement results that must be reported.

[43 FR 15602, Apr. 13, 1978]

§ 60.144 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.142 as follows:

(1) Method 5 for concentration of particulate matter and associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for volumetric flow rate, and

(4) Method 3 for gas analysis.

(5) Method 9 for visible emissions. For the purpose of this subpart, opacity observations taken at 15-second intervals immediately before and after a diversion of exhaust gases from the stack may be considered to be consecutive for the purpose of computing an average opacity for a six-minute period. Observations taken during a diversion shall not be used in determining compliance with the opacity standard.

(b) For Method 5, the sampling for each run shall continue for an integral number of cycles with total duration of at least 60 minutes. The sampling rate shall be at least 0.9 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator. A cycle shall start at the beginning of either the scrap preheat or the oxygen blow and shall terminate immediately prior to tapping.

(c) Sampling of flue gases during each steel production cycle shall be discontinued whenever all flue gases are diverted from the stack and shall be resumed after each diversion period.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9318, Mar. 8, 1974, as amended at 43 FR 8800, Mar. 8, 1978; 43 FR 15602, Apr. 13, 1978]

Subpart O—Standards of Performance for Sewage Treatment Plants

§ 60.150 Applicability and designation of affected facility.

(a) The affected facility is each incinerator that combusts wastes containing more than 10 percent sewage sludge (dry basis) produced by municipal sewage treatment plants, or each incinerator that charges more than 1000 kg (2205 lb) per day municipal sewage sludge (dry basis).

(b) Any facility under paragraph (a) of this section that commences construction or modification after June 11, 1973, is subject to the requirements of this subpart.

(Secs. 111, 114, 301(a), Clean Air Act as amended (42 U.S.C. 1857c-6, 1857c-9, 1857g(a)))

[42 FR 58521, Nov. 10, 1977]

§ 60.151 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

[39 FR 9319, Mar. 8, 1974]

§ 60.152 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator of any sewage sludge incinerator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere of:

(1) Particulate matter at a rate in excess of 0.65 g/kg dry sludge input (1.30 lb/ton dry sludge input).

(2) Any gases which exhibit 20 percent opacity or greater.

[39 FR 9319, Mar. 8, 1974, as amended at 40 FR 46259, Oct. 6, 1975]

§ 60.153 Monitoring of operations.

(a) The owner or operator of any sludge incinerator subject to the provisions of this subpart shall:

(1) Install, calibrate, maintain, and operate a flow measuring device which can be used to determine either the mass or volume of sludge charged to the incinerator. The flow measuring device shall have an accuracy of ±5 percent over its operating range.

(2) Provide access to the sludge charged so that a well-mixed representative grab sample of the sludge can be obtained.

(3) Install, calibrate, maintain, and operate a weighing device for determining the mass of any municipal solid waste charged to the incinerator when sewage sludge and municipal solid waste are incinerated together. The weighing device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[42 FR 58521, Nov. 10, 1977, as amended at 43 FR 8800, Mar. 8, 1978]

§ 60.154 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.152 as follows:

(1) Method 5 for concentration of particulate matter and associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.015 dscm/min (0.53 dscf/min), except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) Dry sludge charging rate shall be determined as follows:

(1) Determine the mass (S_M) or volume (S_V) of sludge charged to the incinerator during each run using a flow measuring device meeting the requirements of § 60.153(a)(1). If total input during a run is measured by a flow measuring device, such readings shall be used. Otherwise, record the flow measuring device readings at 5-minute intervals during a run. Determine the quantity charged during each interval by averaging the flow rates at the beginning and end of the interval and then multiplying the average for each interval by the time for each interval. Then add the quantity for each interval to determine the total quantity charged during the entire run, (S_M) or (S_V).

(2) Collect samples of the sludge charged to the incinerator in nonporous collecting jars at the beginning of each run and at approximately 1-hour intervals thereafter until the test ends, and determine for each sample the dry sludge content (total solids residue) in accordance with "224 G. Method for Solid and Semisolid Samples," *Standard Methods for the Examination of Water and Wastewater*, Thirteenth Edition, American Public Health Association, Inc., New York, N.Y., 1971, pp. 539-41, except that:

(i) Evaporating dishes shall be ignited to at least 103°C rather than the 550°C specified in step 3(a)(1).

(ii) Determination of volatile residue, step 3(b) may be deleted.

(iii) The quantity of dry sludge per unit sludge charged shall be determined in terms of either R_{DV} (metric units: mg dry sludge/liter sludge charged or English units: lb/ft^3) or R_{DM} (metric units: mg dry sludge/mg sludge charged or English units: lb/lb).

(3) Determine the quantity of dry sludge per unit sludge charged in terms of either R_{DV} or R_{DM}.

(i) If the volume of sludge charged is used:

$$S_D = (60 \times 10^{-3})(R_{DV} S_V / T) \text{(Metric Units)}$$

or

$$S_D = (8.021)(R_{DV} S_V / T) \text{(English Units)}$$

where:

S_D = average dry sludge charging rate during the run, kg/hr (English units: lb/hr).

R_{DV} = average quantity of dry sludge per unit volume of sludge charged to the incinerator, mg/l (English units: lb/ft^3).

S_V = sludge charged to the incinerator during the run, m^3 (English units: gal).

T = duration of run, min (English units: min).

60×10^{-3} = metric units conversion factor, 1-kg-min/m^3-mg-hr.

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8.021 = English units conversion factor, ft^3-min/gal-hr.

(ii) If the mass of sludge charged is used:

$S_D = (60)(R_{DM}S_M/T)$(Metric or English Units)

where:

S_D = average dry sludge charging rate during the run, kg/hr (English units: lb/hr).

R_{DM} = average ratio of quantity of dry sludge to quantity of sludge charged to the incinerator, mg/mg (English units: lb/lb).

S_M = sludge charged during the run, kg (English units: lb).

T = duration of run, min (Metric or English units).

60 = conversion factor, min/hr (Metric or English units).

(d) Particulate emission rate shall be determined by:

$C_{aa} = C_sQ_s$ (Metric or English Units)

where:

C_{aa} = particulate matter mass emissions, mg/hr (English units: lb/hr).

C_s = particulate matter concentration, mg/m^3 (English units: lb/dscf).

Q_s = volumetric stack gas flow rate, dscm/hr (English units: dscf/hr). Q_s and C_s shall be determined using Methods 2 and 5, respectively. (e) Compliance with § 60.152(a) shall be determined as follows:

$C_{da} = (10^{-3})(C_{aa}/S_D)$(Metric Units) or
$C_{da} = (2000)(C_{aa}/S_D)$ (English Units)

where:

C_{da} = particulate emission discharge, g/kg dry sludge (English units: lb/ton dry sludge).

10^{-3} = Metric conversion factor, g/mg.

2000 = English conversion factor, lb/ton.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[39 FR 9319, Mar. 8, 1974; 39 FR 13776, Apr. 17, 1974; 39 FR 15396, May 3, 1974, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart P—Standards of Performance for Primary Copper Smelters

SOURCE: 41 FR 2338, Jan. 15, 1976, unless otherwise noted.

§ 60.160 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in primary copper smelters: Dryer, roaster, smelting furnace, and copper converter.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 16, 1974, is subject to the requirements of this subpart.

(Secs. 111 and 301(a). of the Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.161 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Primary copper smelter" means any installation or any intermediate process engaged in the production of copper from copper sulfide ore concentrates through the use of pyrometallurgical techniques.

(b) "Dryer" means any facility in which a copper sulfide ore concentrate charge is heated in the presence of air to eliminate a portion of the moisture from the charge, provided less than 5 percent of the sulfur contained in the charge is eliminated in the facility.

(c) "Roaster" means any facility in which a copper sulfide ore concentrate charge is heated in the presence of air to eliminate a significant portion (5 percent or more) of the sulfur contained in the charge.

(d) "Calcine" means the solid materials produced by a roaster.

(e) "Smelting" means processing techniques for the melting of a copper sulfide ore concentrate or calcine charge leading to the formation of separate layers of molten slag, molten copper, and/or copper matte.

(f) "Smelting furnace" means any vessel in which the smelting of copper sulfide ore concentrates or calcines is performed and in which the heat necessary for smelting is provided by an electric current, rapid oxidation of a portion of the sulfur contained in the concentrate as it passes through an oxidizing atmosphere, or the combustion of a fossil fuel.

(g) "Copper converter" means any vessel to which copper matte is charged and oxidized to copper.

(h) "Sulfuric acid plant" means any facility producing sulfuric acid by the contact process.

(i) "Fossil fuel" means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.

(j) "Reverberatory smelting furnace" means any vessel in which the smelting of copper sulfide ore concentrates or calcines is performed and in which the heat necessary for smelting is provided primarily by combustion of a fossil fuel.

(k) "Total smelter charge" means the weight (dry basis) of all copper sulfide ore concentrates processed at a primary copper smelter, plus the weight of all other solid materials introduced into the roasters and smelting furnaces at a primary copper smelter, except calcine, over a one-month period.

(l) "High level of volatile impurities" means a total smelter charge containing more than 0.2 weight percent arsenic, 0.1 weight percent antimony, 4.5 weight percent lead or 5.5 weight percent zinc, on a dry basis.

§ 60.162 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any dryer any gases which contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

§ 60.163 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any roaster, smelting furnace, or copper converter any gases which contain sulfur dioxide in excess of 0.065 percent by volume, except as provided in paragraphs (b) and (c) of this section.

(b) Reverberatory smelting furnaces shall be exempted from paragraph (a) of this section during periods when the total smelter charge at the primary copper smelter contains a high level of volatile impurities.

(c) A change in the fuel combusted in a reverberatory smelting furnace shall not be considered a modification under this part.

§ 60.164 Standard for visible emissions.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any dryer any visible emissions which exhibit greater than 20 percent opacity.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility that uses a sulfuric acid plant to comply with the standard set forth in § 60.163, any visible emissions which exhibit greater than 20 percent opacity.

§ 60.165 Monitoring of operations.

(a) The owner or operator of any primary copper smelter subject to § 60.163 (b) shall keep a monthly record of the total smelter charge and the weight percent (dry basis) of arsenic, antimony, lead and zinc contained in this charge. The analytical methods and procedures employed to determine the weight of the total smelter charge and the weight percent of arsenic, antimony, lead and zinc shall be approved by the Administrator and shall be accurate to within plus or minus ten percent.

(b) The owner or operator of any primary copper smelter subject to the provisions of this subpart shall install and operate:

(1) A continuous monitoring system to monitor and record the opacity of gases discharged into the atmosphere from any dryeq. The span of this system shall be set at 80 to 100 percent opacity.

(2) A continuous monitoring system to monitor and record sulfur dioxide emissions discharged into the atmosphere from any roaster, smelting fur-

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nace or copper converter subject to § 60.163 (a). The span of this system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(i) The continuous monitoring system performance evaluation required under § 60.13(c) shall be completed prior to the initial performance test required under § 60.8. During the performance evaluation, the span of the continuous monitoring system may be set at a sulfur dioxide concentration of 0.15 percent by volume if necessary to maintain the system output between 20 percent and 90 percent of full scale. Upon completion of the continuous monitoring system performance evaluation, the span of the continuous monitoring system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(ii) For the purpose of the continuous monitoring system performance evaluation required under § 60.13(c) the reference method referred to under the Field Test for Accuracy (Relative) in Performance Specification 2 of Appendix B to this part shall be Reference Method 6. For the performance evaluation, each concentration measurement shall be of one hour duration. The pollutant gas used to prepare the calibration gas mixtures required under paragraph 2.1, Performance Specification 2 of Appendix B, and for calibration checks under § 60.13 (d), shall be sulfur dioxide.

(c) Six-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the four consecutive 6-hour periods of each operating day. Each six-hour average shall be determined as the arithmetic mean of the appropriate six contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system installed under paragraph (b) of this section.

(d) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) Opacity. Any six-minute period during which the average opacity, as measured by the continuous monitoring system installed under paragraph (b) of this section, exceeds the standard under § 60.164(a).

(2) Sulfur dioxide. All six-hour periods during which the average emissions of sulfur dioxide, as measured by the continuous monitoring system installed under § 60.163, exceed the level of the standard. The Administrator will not consider emissions in excess of the level of the standard for less than or equal to 1.5 percent of the six-hour periods during the quarter as indicative of a potential violation of § 60.11(d) provided the affected facility, including air pollution control equipment, is maintained and operated in a manner consistent with good air pollution control practice for minimizing emissions during these periods. Emissions in excess of the level of the standard during periods of startup, shutdown, and malfunction are not to be included within the 1.5 percent.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2338, Jan. 15, 1976; 41 FR 8346, Feb. 26, 1976, as amended at 42 FR 57126, Nov. 1, 1977; 43 FR 8800, Mar. 3, 1978]

§ 60.166 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in §§ 60.162, 60.163 and 60.164 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content.

(2) Sulfur dioxide concentrations shall be determined using the continuous monitoring system installed in accordance with § 60.165(b). One 6-hour average period shall constitute one run. The monitoring system drift during any run shall not exceed 2 percent of span.

(b) For Method 5, Method 1 shall be used for selecting the sampling site and the number of traverse points, Method 2 for determining velocity and volumetric flow rate and Method 3 for determining the gas analysis. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf) except that smaller times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2338, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart Q—Standards of Performance for Primary Zinc Smelters

SOURCE: 41 FR 2340, Jan. 15, 1976, unless otherwise noted.

§ 60.170 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in primary zinc smelters: roaster and sintering machine.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 16, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.171 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Primary zinc smelter" means any installation engaged in the production, or any intermediate process in the production, of zinc or zinc oxide from zinc sulfide ore concentrates through the use of pyrometallurgical techniques.

(b) "Roaster" means any facility in which a zinc sulfide ore concentrate charge is heated in the presence of air to eliminate a significant portion (more than 10 percent) of the sulfur contained in the charge.

(c) "Sintering machine" means any furnace in which calcines are heated in the presence of air to agglomerate the calcines into a hard porous mass called "sinter."

(d) "Sulfuric acid plant" means any facility producing sulfuric acid by the contact process.

§ 60.172 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any sintering machine any gases which contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

§ 60.173 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any roaster any gases which contain sulfur dioxide in excess of 0.065 percent by volume.

(b) Any sintering machine which eliminates more than 10 percent of the sulfur initially contained in the zinc sulfide ore concentrates will be considered as a roaster under paragraph (a) of this section.

§ 60.174 Standard for visible emissions.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any sintering machine any visible emissions which exhibit greater than 20 percent opacity.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility that uses a sulfuric acid plant to comply with the standard set forth in § 60.173, any visible emissions which exhibit greater than 20 percent opacity.

§ 60.175 Monitoring of operations.

(a) The owner or operator of any primary zinc smelter subject to the provisions of this subpart shall install and operate:

(1) A continuous monitoring system to monitor and record the opacity of gases discharged into the atmosphere from any sintering machine. The span of this system shall be set at 80 to 100 percent opacity.

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(2) A continuous monitoring system to monitor and record sulfur dioxide emissions discharged into the atmosphere from any roaster subject to § 60.173. The span of this system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(i) The continuous monitoring system performance evaluation required under § 60.13(c) shall be completed prior to the initial performance test required under § 60.8. During the performance evaluation, the span of the continuous monitoring system may be set at a sulfur dioxide concentration of 0.15 percent by volume if necessary to maintain the system output between 20 percent and 90 percent of full scale. Upon completion of the continuous monitoring system performance evaluation, the span of the continuous monitoring system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(ii) For the purpose of the continuous monitoring system performance evaluation required under § 60.13(c), the reference method referred to under the Field Test for Accuracy (Relative) in Performance Specification 2 of Appendix B to this part shall be Reference Method 6. For the performance evaluation, each concentration measurement shall be of 1 hour duration. The pollutant gas used to prepare the calibration gas mixtures required under paragraph 2.1, Performance Specification 2 of Appendix B, and for calibration checks under § 60.13(d), shall be sulfur dioxide.

(b) Two-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the 12 consecutive 2-hour periods of each operating day. Each 2-hour average shall be determined as the arithmetic mean of the appropriate two contiguous 1-hour average sulfur dioxide concentrations provided by the continuous monitoring system installed under paragraph (a) of this section.

(c) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) Opacity. Any 6-minute period during which the average opacity, as measured by the continuous monitoring system installed under paragraph (a) of this section, exceeds the standard under § 60.174(a).

(2) Sulfur dioxide. Any 2-hour period, as described in paragraph (b) of this section, during which the average emissions of sulfur dioxide, as measured by the continuous monitoring system installed under paragraph (a) of this section, exceeds the standard under § 60.173.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2340, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.176 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in §§ 60.172, 60.173 and 60.174 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content.

(2) Sulfur dioxide concentrations shall be determined using the continuous monitoring system installed in accordance with § 60.175(a). One 2-hour average period shall constitute one run.

(b) For Method 5, Method 1 shall be used for selecting the sampling site and the number of traverse points, Method 2 for determining velocity and volumetric flow rate and Method 3 for determining the gas analysis. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf) except that smaller times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2340, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart R—Standards of Performance for Primary Lead Smelters

SOURCE: 41 FR 2340, Jan. 15, 1976, unless otherwise noted.

§ 60.180 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in primary lead smelters: sintering machine, sintering machine discharge end, blast furnace, dross reverberatory furnace, electric smelting furnace, and converter.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 16, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.181 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Primary lead smelter" means any installation or any intermediate process engaged in the production of lead from lead sulfide ore concentrates through the use of pyrometallurgical techniques.

(b) "Sintering machine" means any furnace in which a lead sulfide ore concentrate charge is heated in the presence of air to eliminate sulfur contained in the charge and to agglomerate the charge into a hard porous mass called "sinter."

(c) "Sinter bed" means the lead sulfide ore concentrate charge within a sintering machine.

(d) "Sintering machine discharge end" means any apparatus which receives sinter as it is discharged from the conveying grate of a sintering machine.

(e) "Blast furnace" means any reduction furnace to which sinter is charged and which forms separate layers of molten slag and lead bullion.

(f) "Dross reverberatory furnace" means any furnace used for the removal or refining of impurities from lead bullion.

(g) "Electric smelting furnace" means any furnace in which the heat necessary for smelting of the lead sulfide ore concentrate charge is generated by passing an electric current through a portion of the molten mass in the furnace.

(h) "Converter" means any vessel to which lead concentrate or bullion is charged and refined.

(i) "Sulfuric acid plant" means any facility producing sulfuric acid by the contact process.

§ 60.182 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any blast furnace, dross reverberatory furnace, or sintering machine discharge end any gases which contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf).

§ 60.183 Standard for sulfur dioxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any sintering machine, electric smelting furnace, or converter gases which contain sulfur dioxide in excess of 0.065 percent by volume.

§ 60.184 Standard for visible emissions.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any blast furnace, dross reverberatory furnace, or sintering machine discharge end any visible emissions which exhibit greater than 20 percent opacity.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility that uses a sulfuric acid plant to comply with the standard set forth in § 60.183, any visible emissions which exhibit greater than 20 percent opacity.

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§ 60.185 Monitoring of operations.

(a) The owner or operator of any primary lead smelter subject to the provisions of this subpart shall install and operate:

(1) A continuous monitoring system to monitor and record the opacity of gases discharged into the atmosphere from any blast furnace, dross reverberatory furnace, or sintering machine discharge end. The span of this system shall be set at 80 to 100 percent opacity.

(2) A continuous monitoring system to monitor and record sulfur dioxide emissions discharged into the atmosphere from any sintering machine, electric furnace or converter subject to § 60.183. The span of this system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(i) The continuous monitoring system performance evaluation required under § 60.13(c) shall be completed prior to the initial performance test required under § 60.8. During the performance evaluation, the span of the continuous monitoring system may be set at a sulfur dioxide concentration of 0.15 percent by volume if necessary to maintain the system output between 20 percent and 90 percent of full scale. Upon completion of the continuous monitoring system performance evaluation, the span of the continuous monitoring system shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

(ii) For the purpose of the continuous monitoring system performance evaluation required under § 60.13(c), the reference method referred to under the Field Test for Accuracy (Relative) in Performance Specification 2 of Appendix B to this part shall be Reference Method 6. For the performance evaluation, each concentration measurement shall be of one hour duration. The pollutant gases used to prepare the calibration gas mixtures required under paragraph 2.1, Performance Specification 2 of Appendix B, and for calibration checks under § 60.13(d), shall be sulfur dioxide.

(b) Two-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the twelve consecutive two-hour periods of each operating day. Each two-hour average shall be determined as the arithmetic mean of the appropriate two contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system installed under paragraph (a) of this section.

(c) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) Opacity. Any six-minute period during which the average opacity, as measured by the continuous monitoring system installed under paragraph (a) of this section, exceeds the standard under § 60.184(a).

(2) Sulfur dioxide. Any two-hour period, as described in paragraph (b) of this section, during which the average emissions of sulfur dioxide, as measured by the continuous monitoring system installed under paragraph (a) of this section, exceeds the standard under § 60.183.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2340, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.186 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in §§ 60.182, 60.183 and 60.184 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content.

(2) Sulfur dioxide concentrations shall be determined using the continuous monitoring system installed in accordance with § 60.185(a). One 2-hour average period shall constitute one run.

(b) For Method 5, Method 1 shall be used for selecting the sampling site and the number of traverse points, Method 2 for determining velocity and volumetric flow rate and Method 3 for determining the gas analysis. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf) except that smaller times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2340, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart S—Standards of Performance for Primary Aluminum Reduction Plants

SOURCE: 45 FR 44207, June 30, 1980, unless otherwise noted.

§ 60.190 Applicability and designation of affected facility.

(a) The affected facilities in primary aluminum reduction plants to which this subpart applies are potroom groups and anode bake plants.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 23, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977, as amended at 45 FR 44206, June 30, 1980]

§ 60.191 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in subpart A of this part.

"Aluminum equivalent" means an amount of aluminum which can be produced from a Mg of anodes produced by an anode bake plant as determined by § 60.195(g).

"Anode bake plant" means a facility which produces carbon anodes for use in a primary aluminum reduction plant.

"Potroom" means a building unit which houses a group of electrolytic cells in which aluminum is produced.

"Potroom group" means an uncontrolled potroom, a potroom which is controlled individually, or a group of potrooms or potroom segments ducted to a common control system.

"Primary aluminum reduction plant" means any facility manufacturing aluminum by electrolytic reduction.

"Primary control system" means an air pollution control system designed to remove gaseous and particulate flourides from exhaust gases which are captured at the cell.

"Roof monitor" means that portion of the roof of a potroom where gases not captured at the cell exit from the potroom.

"Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.195 or by equivalent or alternative methods (see § 60.8(b)).

§ 60.192 Standards for fluorides.

(a) On and after the date on which the initial performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases containing total fluorides, as measured according to § 60.8 above, in excess of:

(1) 1.0 kg/Mg (2.0 lb/ton) of aluminum produced for potroom groups at Soderberg plants: except that emissions between 1.0 kg/Mg and 1.3 kg/Mg (2.6 lb/ton) will be considered in compliance if the owner or operator demonstrates that exemplary operation and maintenance procedures were used with respect to the emission control system and that proper control equipment was operating at the affected facility during the performance tests;

(2) 0.95 kg/Mg (1.9 lb/ton) of aluminum produced for potroom groups at prebake plants; except that emissions between 0.95 kg/Mg and 1.25 kg/Mg (2.5 lb/ton) will be considered in compliance if the owner or operator demonstrates that exemplary operation and maintenance procedures were used with respect to the emission control system and that proper control equipment was operating at the affected facility during the performance test; and

(3) 0.05 kg/Mg (0.1 lb/ton) of aluminum equivalent for anode bake plants.

(b) Within 30 days of any performance test which reveals emissions which fall between the 1.0 kg/Mg and 1.3 kg/Mg levels in paragraph (a)(1) of this section or between the 0.95 kg/Mg and 1.25 kg/Mg levels in paragraph (a)(2) of this section, the owner or operator shall submit a report indicating

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whether all necessary control devices were on-line and operating properly during the performance test, describing the operating and maintenance procedures followed, and setting forth any explanation for the excess emissions, to the Director of the Enforcement Division of the appropriate EPA Regional Office.

§ 60.193 Standard for visible emissions.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any potroom group any gases which exhibit 10 percent opacity or greater, or

(2) From any anode bake plant any gases which exhibit 20 percent opacity or greater.

§ 60.194 Monitoring of operations.

(a) The owner or operator of any affected facility subject to the provisions of this subpart shall install, calibrate, maintain, and operate monitoring devices which can be used to determine daily the weight of aluminum and anode produced. The weighing devices shall have an accuracy of ± 5 percent over their operating range.

(b) The owner or operator of any affected facility shall maintain a record of daily production rates of aluminum and anodes, raw material feed rates, and cell or potline voltages.

(Section 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.195 Test methods and procedures.

(a) Following the initial performance test as required under § 60.8(a), an owner or operator shall conduct a performance test at least once each month during the life of the affected facility, except when malfunctions prevent representative sampling, as provided under § 60.8(c). The owner or operator shall give the Administrator at least 15 days advance notice of each test. The Administrator may require additional testing under section 114 of the Clean Air Act.

(b) An owner or operator may petition the Administrator to establish an alternative testing requirement that requires testing less frequently than once each month for a primary control system or an anode bake plant. If the owner or operator show that emissions from the primary control system or the anode bake plant have low variability during day-to-day operations, the Administrator may establish such an alternative testing requirement. The alternative testing requirement shall include a testing schedule and, in the case of a primary control system, the method to be used to determine primary control system emissions for the purpose of performance tests. The Administrator shall publish the alternative testing requirement in the FEDERAL REGISTER.

(1) Alternative testing requirements are established for Anaconda Aluminum Company's Sebree plant in Henderson, Kentucky: the anode bake plant and primary control system are to be tested once a year rather than once a month.

(c) Except as provided in § 60.8(b), reference methods specified in Appendix A of this part shall be used to determine compliance with the standards prescribed in § 60.192 as follows:

(1) For sampling emissions from stacks:

(i) Method 1 for sample and velocity traverses,

(ii) Method 2 for velocity and volumetric flow rate,

(iii) Method 3 for gas analysis, and

(iv) Method 13A or 13B for the concentration of total fluorides and the associated moisture content.

(2) For sampling emissions from roof monitors not employing stacks or pollutant collection systems:

(i) Method 1 for sample and velocity traverses,

(ii) Method 2 and Method 14 for velocity and volumetric flow rate,

(iii) Method 3 for gas analysis, and

(iv) Method 14 for the concentration of total fluorides and associated moisture content.

(3) For sampling emissions from roof monitors not employing stacks but equipped with pollutant collection systems, the procedures under § 60.8(b) shall be followed.

(d) For Method 13A or 13B, the sampling time for each run shall be at least 8 hours for any potroom sample

and at least 4 hours for any anode bake plant sample, and the minimum sample volume shall be 6.8 dscm (240 dscf) for any potroom sample and 3.4 dscm (120 dscf) for any anode bake plant sample except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(e) The air pollution control system for each affected facility shall be constructed so that volumetric flow rates and total fluoride emissions can be accurately determined using applicable methods specified under paragraph (c) of this section.

(f) The rate of aluminum production is determined by dividing 720 hours into the weight of aluminum tapped from the affected facility during a period of 30 days prior to and including the final run of a performance test.

(g) For anode bake plants, the aluminum equivalent for anodes produced shall be determined as follows:

(1) Determine the average weight (Mg) of anode produced in anode bake plant during a representative oven cycle using a monitoring device which meets the requirements of § 60.194(a).

(2) Determine the average rate of anode production by dividing the total weight of anodes produced during the representative oven cycle by the length of the cycle in hours.

(3) Calculate the aluminum equivalent for anodes produced by multiplying the average rate of anode production by two. (Note: An owner or operator may establish a different multiplication factor by submitting production records of the Mg of aluminum produced and the concurrent Mg of anode consumed by potrooms.)

(h) For each run, potroom group emissions expressed in kg/Mg of aluminum produced shall be determined using the following equation:

$$Epg = \frac{(CsQs)_1 10^{-6} + (CsQs)_2 10^{-6}}{M}$$

Where:

Epg = potroom group emissions of total fluorides in kg/Mg of aluminum produced.

Cs = concentration of total fluorides in mg/dscm as determined by Method 13A or 13B, or by Method 14, as applicable.

Qs = volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2 and/or Method 14, as applicable.

10^{-6} = conversion factor from mg to kg.

M = rate of aluminum production in Mg/hr as determined by § 60.195(f).

$(CsQs)_1$ = product of Cs and Qs for measurements of primary control system effluent gas streams.

$(CsQs)_2$ = product of Cs and Qs for measurements of secondary control system or roof monitor effluent gas streams.

Where an alternative testing requirement has been established for the primary control system, the calculated value $(CsQs)_1$ from the most recent performance test will be used.

(i) For each run, as applicable, anode bake plant emissions expressed in kg/Mg of aluminum equivalent shall be determined using the following equation:

$$Ebp = \frac{CsQs\ 10^{-6}}{Me}$$

Where:

Ebp = anode bake plant emissions of total fluorides in kg/Mg of aluminum equivalent.

Cs = concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Qs = volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-6} = conversion factor from mg to kg.

Me = aluminum equivalent for anodes produced by anode bake plants in Mg/hr as determined by § 60.195(g).

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

[45 FR 44207, June 30, 1980, as amended at 46 FR 61126, Dec. 15, 1981]

Subpart T—Standards of Performance for the Phosphate Fertilizer Industry: Wet-Process Phosphoric Acid Plants

SOURCE: 40 FR 33154, Aug. 6, 1975, unless otherwise noted.

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§ 60.200 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each wet-process phosphoric acid plant. For the purpose of this subpart, the affected facility includes any combination of: Reactors, filters, evaporators, and hotwells.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 22, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.201 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Wet-process phosphoric acid plant" means any facility manufacturing phosphoric acid by reacting phosphate rock and acid.

(b) "Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.204, or equivalent or alternative methods.

(c) "Equivalent P_2O_5 feed" means the quantity of phosphorus, expressed as phosphorous pentoxide, fed to the process.

§ 60.202 Standard for fluorides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain total fluorides in excess of 10.0 g/metric ton of equivalent P_2O_5 feed (0.020 lb/ton).

§ 60.203 Monitoring of operations.

(a) The owner or operator of any wet-process phosphoric acid plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a monitoring device which can be used to determine the mass flow of phosphorus-bearing feed material to the process. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(b) The owner or operator of any wet-process phosphoric acid plant shall maintain a daily record of equivalent P_2O_5 feed by first determining the total mass rate in metric ton/hr of phosphorus bearing feed using a monitoring device for measuring mass flowrate which meets the requirements of paragraph (a) of this section and then by proceeding according to § 60.204(d)(2).

(c) The owner or operator of any wet-process phosphoric acid subject to the provisions of this part shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the process scrubbing system. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33154, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.204 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.202 as follows:

(1) Method 13A or 13B for the concentration of total fluorides and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 13A or 13B, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) The air pollution control system for the affected facility shall be constructed so that volumetric flow rates and total fluoride emissions can be ac-

curately determined by applicable test methods and procedures.

(d) Equivalent P_2O_5 feed shall be determined as follows:

(1) Determine the total mass rate in metric ton/hr of phosphorus-bearing feed during each run using a flow monitoring device meeting the requirements of § 60.203(a).

(2) Calculate the equivalent P_2O_5 feed by multiplying the percentage P_2O_5 content, as measured by the spectrophotometric molybdovanadophosphate method (AOAC Method 9), times the total mass rate of phosphorus-bearing feed. AOAC Method 9 is published in the Official Methods of Analysis of the Association of Official Analytical Chemists, 11th edition, 1970, pp. 11-12. Other methods may be approved by the Administrator.

(e) For each run, emissions expressed in g/metric ton of equivalent P_2O_5 feed shall be determined using the following equation:

$$E = (C_s Q_s)\ 10^{-3} / M_{P_2O_5}$$

where:

E = Emissions of total fluorides in g/metric ton of equivalent P_2O_5 feed.

C_s = Concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-3} = Conversion factor for mg to g.

$M_{P_2O_5}$ = Equivalent P_2O_5 feed in metric ton/hr as determined by § 60.204(d).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33154, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart U—Standards of Performance for the Phosphate Fertilizer Industry: Superphosphoric Acid Plants

SOURCE: 40 FR 33155, Aug. 6, 1975, unless otherwise noted.

§ 60.210 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each superphosphoric acid plant. For the purpose of this subpart, the affected facility includes any combination of: Evaporators, hotwells, acid sumps, and cooling tanks.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 22, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37937, July 25, 1977]

§ 60.211 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Superphosphoric acid plant" means any facility which concentrates wet-process phosphoric acid to 66 percent or greater P_2O_5 content by weight for eventual consumption as a fertilizer.

(b) "Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.214, or equivalent or alternative methods.

(c) "Equivalent P_2O_5 feed" means the quantity of phosphorus, expressed as phosphorous pentoxide, fed to the process.

§ 60.212 Standard for fluorides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain total fluorides in excess of 5.0 g/metric ton of equivalent P_2O_5 feed (0.010 lb/ton).

§ 60.213 Monitoring of operations.

(a) The owner or operator of any superphosphoric acid plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a flow monitoring device which can be used to determine the mass flow of phosphorus-bearing feed material to the process. The flow monitoring device shall have an accuracy of ±5 percent over its operating range.

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(b) The owner or operator of any superphosphoric acid plant shall maintain a daily record of equivalent P_2O_5 feed by first determining the total mass rate in metric ton/hr of phosphorus-bearing feed using a flow monitoring device meeting the requirements of paragraph (a) of this section and then by proceeding according to § 60.214(d)(2).

(c) The owner or operator of any superphosphoric acid plant subject to the provisions of this part shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the process scrubbing system. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33155, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.214 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.212 as follows:

(1) Method 13A or 13B for the concentration of total fluorides and the associated moisture content.

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 13A or 13B, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be at least 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) The air pollution control system for the affected facility shall be constructed so that volumetric flow rates and total fluoride emissions can be accurately determined by applicable test methods and procedures.

(d) Equivalent P_2O_5 feed shall be determined as follows:

(1) Determine the total mass rate in metric ton/hr of phosphorus-bearing feed during each run using a flow monitoring device meeting the requirements of § 60.213(a).

(2) Calculate the equivalent P_2O_5 feed by multiplying the percentage P_2O_5 content, as measured by the spectrophotometric molybdovanadophosphate method (AOAC Method 9), times the total mass rate of phosphorus-bearing feed. AOAC Method 9 is published in the Official Methods of Analysis of the Association of Official Analytical Chemists, 11th edition, 1970, pp. 11-12. Other methods may be approved by the Administrator.

(e) For each run, emissions expressed in g/metric ton of equivalent P_2O_5 feed, shall be determined using the following equation:

$$E = (C_s Q_s)\, 10^{-3} / M_{P_2O_5}$$

where:

E = Emissions of total fluorides in g/metric ton of equivalent P_2O_5 feed.

C_s = Concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-3} = Conversion factor for mg to g.

$M_{P_2O_5}$ = Equivalent P_2O_5 feed in metric ton/hr as determined by § 60.214(d).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33155, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart V—Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants

SOURCE: 40 FR 33155, Aug. 6, 1975, unless otherwise noted.

§ 60.220 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each granular diammonium phosphate plant. For the purpose of this subpart, the affected facility includes any combination of: Reactors, granulators, dryers, coolers, screens and mills.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 22, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977]

§ 60.221 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Granular diammonium phosphate plant" means any plant manufacturing granular diammonium phosphate by reacting phosphoric acid with ammonia.

(b) "Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.224, or equivalent or alternative methods.

(c) "Equivalent P_2O_5 feed" means the quantity of phosphorus, expressed as phosphorus pentoxide, fed to the process.

§ 60.222 Standard for fluorides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain total fluorides in excess of 30 g/metric ton of equivalent P_2O_5 feed (0.060 lb/ton).

§ 60.223 Monitoring of operations.

(a) The owner or operator of any granular diammonium phosphate plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a flow monitoring device which can be used to determine the mass flow of phosphorus-bearing feed material to the process. The flow monitoring device shall have an accuracy of ±5 percent over its operating range.

(b) The owner or operator of any granular diammonium phosphate plant shall maintain a daily record of equivalent P_2O_5 feed by first determining the total mass rate in metric ton/hr of phosphorus-bearing feed using a flow monitoring device meeting the requirements of paragraph (a) of this section and then by proceeding according to § 60.224(d)(2).

(c) The owner or operator of any granular diammonium phosphate plant subject to the provisions of this part shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the scrubbing system. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33155, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.224 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.222 as follows:

(1) Method 13A or 13B for the concentration of total fluorides and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 13A or 13B, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be at least 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes when necessitated by process variables or other factors, may be approved by the Administrator.

(c) The air pollution control system for the affected facility shall be constructed so that volumetric flow rates and total fluoride emissions can be accurately determined by applicable test methods and procedures.

(d) Equivalent P_2O_5 feed shall be determined as follows:

(1) Determine the total mass rate in metric ton/hr of phosphorus-bearing feed during each run using a flow monitoring device meeting the requirements of § 60.223(a).

(2) Calculate the equivalent P_2O_5 feed by multiplying the percentage P_2O_5 content, as measured by the spectrophotometric molybdovanadophosphate method

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(AOAC Method 9), times the total mass rate of phosphorus-bearing feed. AOAC Method 9 is published in the Official Methods of Analysis of the Association of Official Analytical Chemists, 11th edition, 1970, pp. 11-12. Other methods may be approved by the Administrator.

(e) For each run, emissions expressed in g/metric ton of equivalent P_2O_5 feed shall be determined using the following equation:

$$E = (C_s Q_s)\ 10^{-3} / M_{P_2O_5}$$

where:

E = Emissions of total fluorides in g/metric ton of equivalent P_2O_5 feed.

C_s = Concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-3} = Conversion factor for mg to g.

$M_{P_2O_5}$ = Equivalent P_2O_5 feed in metric ton/hr as determined by § 60.224(d).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33155, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart W—Standards of Performance for the Phosphate Fertilizer Industry: Triple Superphosphate Plants

SOURCE: 40 FR 33156, Aug. 6, 1975, unless otherwise noted.

§ 60.230 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each triple superphosphate plant. For the purpose of this subpart, the affected facility includes any combination of: Mixers, curing belts (dens), reactors, granulators, dryers, cookers, screens, mills and facilities which store run-of-pile triple superphosphate.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 22, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977]

§ 60.231 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Triple superphosphate plant" means any facility manufacturing triple superphosphate by reacting phosphate rock with phosphoric acid. A run-of-pile triple superphosphate plant includes curing and storing.

(b) "Run-of-pile triple superphosphate" means any triple superphosphate that has not been processed in a granulator and is composed of particles at least 25 percent by weight of which (when not caked) will pass through a 16 mesh screen.

(c) "Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.234, or equivalent or alternative methods.

(d) "Equivalent P_2O_5 feed" means the quantity of phosphorus, expressed as phosphorus pentoxide, fed to the process.

§ 60.232 Standard for fluorides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain total fluorides in excess of 100 g/metric ton of equivalent P_2O_5 feed (0.20 lb/ton).

§ 60.233 Monitoring of operations.

(a) The owner or operator of any triple superphosphate plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a flow monitoring device which can be used to determine the mass flow of phosphorus-bearing feed material to the process. The flow monitoring device shall have an accuracy of ±5 percent over its operating range.

(b) The owner or operator of any triple superphosphate plant shall maintain a daily record of equivalent P_2O_5 feed by first determining the total mass rate in metric ton/hr of phosphorus-bearing feed using a flow monitoring device meeting the require-

ments of paragraph (a) of this section and then by proceeding according to § 60.234(d)(2).

(c) The owner or operator of any triple superphosphate plant subject to the provisions of this part shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the process scrubbing system. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33156, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.234 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.232 as follows:

(1) Method 13A or 13B for the concentration of total fluorides and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 13A or 13B, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be at least 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) The air pollution control system for the affected facility shall be constructed so that volumetric flow rates and total fluoride emissions can be accurately determined by applicable test methods and procedures.

(d) Equivalent P_2O_5 feed shall be determined as follows:

(1) Determine the total mass rate in metric ton/hr of phosphorus-bearing feed during each run using a flow monitoring device meeting the requirements of § 60.233(a).

(2) Calculate the equivalent P_2O_5 feed by multiplying the percentage P_2O_5 content, as measured by the spectrophotometric molybdovanadophosphate method (AOAC Method 9), times the total mass rate of phosphorus-bearing feed. AOAC Method 9 is published in the Official Methods of Analysis of the Association of Official Analytical Chemists, 11th edition, 1970, pp. 11-12. Other methods may be approved by the Administrator.

(e) For each run, emissions expressed in g/metric ton of equivalent P_2O_5 feed shall be determined using the following equation:

$$E = (C_s Q_s)\ 10^{-3} / M_{P_2O_5}$$

where:

E = Emissions of total fluorides in g/metric ton of equivalent P_2O_5 feed.

C_s = Concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-3} = Conversion factor for mg to g.

$M_{P_2O_5}$ = Equivalent P_2O_5 feed in metric ton/hr as determined by § 60.234(d).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33156, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart X—Standards of Performance for the Phosphate Fertilizer Industry: Granular Triple Superphosphate Storage Facilities

SOURCE: 40 FR 33156, Aug. 6, 1975, unless otherwise noted.

§ 60.240 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each granular triple superphosphate storage facility. For the purpose of this subpart, the affected facility includes any combination of: Storage or curing piles, conveyors, elevators, screens and mills.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 22, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977]

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§ 60.241 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Granular triple superphosphate storage facility" means any facility curing or storing granular triple superphosphate.

(b) "Total fluorides" means elemental fluorine and all fluoride compounds as measured by reference methods specified in § 60.244, or equivalent or alternative methods.

(c) "Equivalent P_2O_5 stored" means the quantity of phosphorus, expressed as phosphorus pentoxide, being cured or stored in the affected facility.

(d) "Fresh granular triple superphosphate" means granular triple superphosphate produced no more than 10 days prior to the date of the performance test.

§ 60.242 Standard for fluorides.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain total fluorides in excess of 0.25 g/hr/metric ton of equivalent P_2O_5 stored (5.0×10^{-4} lb/hr/ton of equivalent P_2O_5 stored).

§ 60.243 Monitoring of operations.

(a) The owner or operator of any granular triple superphosphate storage facility subject to the provisions of this subpart shall maintain an accurate account of triple superphosphate in storage to permit the determination of the amount of equivalent P_2O_5 stored.

(b) The owner or operator of any granular triple superphosphate storage facility shall maintain a daily record of total equivalent P_2O_5 stored by multiplying the percentage P_2O_5 content, as determined by § 60.244(f)(2), times the total mass of granular triple superphosphate stored.

(c) The owner or operator of any granular triple superphosphate storage facility subject to the provisions of this part shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the process scrubbing system. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33156, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.244 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.242 as follows:

(1) Method 13A or 13B for the concentration of total fluorides and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 13A or 13B, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be at least 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) The air pollution control system for the affected facility shall be constructed so that volumetric flow rates and total fluorides emissions can be accurately determined by applicable test methods and procedures.

(d) Except as provided under paragraph (e) of this section, all performance tests on granular triple superphosphate storage facilities shall be conducted only when the following quantities of product are being cured or stored in the facility:

(1) Total granular triple superphosphate—at least 10 percent of the building capacity.

(2) Fresh granular triple superphosphate—at least 20 percent of the amount of triple superphosphate in the building.

(e) If the provisions set forth in paragraph (d)(2) of this section exceed production capabilities for fresh granular triple superphosphate, the

owner or operator shall have at least five days maximum production of fresh granular triple superphosphate in the building during a performance test.

(f) Equivalent P_2O_5 stored shall be determined as follows:

(1) Determine the total mass stored during each run using an accountability system meeting the requirements of § 60.243(a).

(2) Calculate the equivalent P_2O_5 stored by multiplying the percentage P_2O_5 content, as measured by the spectrophotometric molybdovanadophosphate method (AOAC Method 9), times the total mass stored. AOAC Method 9 is published in the Official Methods of Analysis of the Association of Official Analytical Chemists, 11th edition, 1970, pp. 11-12. Other methods may be approved by the Administrator.

(g) For each run, emissions expressed in g/hr/metric ton of equivalent P_2O_5 stored shall be determined using the following equation:

$$E=(C_sQ_s)\,10^{-3}/M_{P_2O_5}$$

where:

E = Emissions of total fluorides in g/hr/metric ton of equivalent P_2O_5 stored.

C_s = Concentration of total fluorides in mg/dscm as determined by Method 13A or 13B.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr as determined by Method 2.

10^{-3} = Conversion factor for mg to g.

$M_{P_2O_5}$ = Equivalent P_2O_5 stored in metric tons as measured by § 60.244(d).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 33156, Aug. 6, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart Y—Standards of Performance for Coal Preparation Plants

SOURCE: 41 FR 2234, Jan. 15, 1976, unless otherwise noted.

§ 60.250 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to any of the following affected facilities in coal preparation plants which process more than 200 tons per day: Thermal dryers, pneumatic coal-cleaning equipment (air tables), coal processing and conveying equipment (including breakers and crushers), coal storage systems, and coal transfer and loading systems.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 24, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977; 42 FR 44812, Sept. 7, 1977]

§ 60.251 Definitions.

As used in this subpart, all terms not defined herein have the meaning given them in the Act and in Subpart A of this part.

(a) "Coal preparation plant" means any facility (excluding underground mining operations) which prepares coal by one or more of the following processes: breaking, crushing, screening, wet or dry cleaning, and thermal drying.

(b) "Bituminous coal" means solid fossil fuel classified as bituminous coal by A.S.T.M. Designation D-388-66.

(c) "Coal" means all solid fossil fuels classified as anthracite, bituminous, subbituminous, or lignite by A.S.T.M. Designation D-388-66.

(d) "Cyclonic flow" means a spiraling movement of exhaust gases within a duct or stack.

(e) "Thermal dryer" means any facility in which the moisture content of bituminous coal is reduced by contact with a heated gas stream which is exhausted to the atmosphere.

(f) "Pneumatic coal-cleaning equipment" means any facility which classifies bituminous coal by size or separates bituminous coal from refuse by application of air stream(s).

(g) "Coal processing and conveying equipment" means any machinery used to reduce the size of coal or to separate coal from refuse, and the equipment used to convey coal to or remove coal and refuse from the machinery. This includes, but is not limited to, breakers, crushers, screens, and conveyor belts.

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(h) "Coal storage system" means any facility used to store coal except for open storage piles.

(i) "Transfer and loading system" means any facility used to transfer and load coal for shipment.

§ 60.252 Standards for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, an owner or operator subject to the provisions of this subpart shall not cause to be discharged into the atmosphere from any thermal dryer gases which:

(1) Contain particulate matter in excess of 0.070 g/dscm (0.031 gr/dscf).

(2) Exhibit 20 percent opacity or greater.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, an owner or operator subject to the provisions of this subpart shall not cause to be discharged into the atmosphere from any pneumatic coal cleaning equipment, gases which:

(1) Contain particulate matter in excess of 0.040 g/dscm (0.018 gr/dscf).

(2) Exhibit 10 percent opacity or greater.

(c) On and after the date on which the performance test required to be conducted by § 60.8 is completed, an owner or operator subject to the provisions of this subpart shall not cause to be discharged into the atmosphere from any coal processing and conveying equipment, coal storage system, or coal transfer and loading system processing coal, gases which exhibit 20 percent opacity or greater.

§ 60.253 Monitoring of operations.

(a) The owner or operator of any thermal dryer shall install, calibrate, maintain, and continuously operate monitoring devices as follows:

(1) A monitoring device for the measurement of the temperature of the gas stream at the exit of the thermal dryer on a continuous basis. The monitoring device is to be certified by the manufacturer to be accurate within ±3° Fahrenheit.

(2) For affected facilities that use venturi scrubber emission control equipment:

(i) A monitoring device for the continuous measurement of the pressure loss through the venturi constriction of the control equipment. The monitoring device is to be certified by the manufacturer to be accurate within ±1 inch water gage.

(ii) A monitoring device for the continuous measurement of the water supply pressure to the control equipment. The monitoring device is to be certified by the manufacturer to be accurate within ±5 percent of design water supply pressure. The pressure sensor or tap must be located close to the water discharge point. The Administrator may be consulted for approval of alternative locations.

(b) All monitoring devices under paragraph (a) of this section are to be recalibrated annually in accordance with procedures under § 60.13(b)(3).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2234, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.254 Test methods and procedures.

(a) The reference methods in Appendix A of this part, except as provided in § 60.8(b), are used to determine compliance with the standards prescribed in § 60.252 as follows:

(1) Method 5 for the concentration of particulate matter and associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run is at least 60 minutes and the minimum sample volume is 0.85 dscm (30 dscf) except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator. Sampling is not to be started until 30 minutes after start-up and is to be terminated before shutdown procedures commence. The owner or operator of the affected facility shall eliminate cyclonic flow during performance tests in a manner acceptable to the Administrator.

(c) The owner or operator shall construct the facility so that particulate

emissions from thermal dryers or pneumatic coal cleaning equipment can be accurately determined by applicable test methods and procedures under paragraph (a) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 2234, Jan. 15, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart Z—Standards of Performance for Ferroalloy Production Facilities

SOURCE: 41 FR 18501, May 4, 1976, unless otherwise noted.

§ 60.260 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities: Electric submerged arc furnaces which produce silicon metal, ferrosilicon, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, high-carbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese, ferromanganese silicon, or calcium carbide; and dust-handling equipment.

(b) Any facility under paragraph (a) of this section that commences construction or modification after October 21, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977]

§ 60.261 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Electric submerged arc furnace" means any furnace wherein electrical energy is converted to heat energy by transmission of current between electrodes partially submerged in the furnace charge.

(b) "Furnace charge" means any material introduced into the electric submerged arc furnace, and may consist of, but is not limited to, ores, slag, carbonaceous material, and limestone.

(c) "Product change" means any change in the composition of the furnace charge that would cause the electric submerged arc furnace to become subject to a different mass standard applicable under this subpart.

(d) "Slag" means the more or less completely fused and vitrified matter separated during the reduction of a metal from its ore.

(e) "Tapping" means the removal of slag or product from the electric submerged arc furnace under normal operating conditions such as removal of metal under normal pressure and movement by gravity down the spout into the ladle.

(f) "Tapping period" means the time duration from initiation of the process of opening the tap hole until plugging of the tap hole is complete.

(g) "Furnace cycle" means the time period from completion of a furnace product tap to the completion of the next consecutive product tap.

(h) "Tapping station" means that general area where molten product or slag is removed from the electric submerged arc furnace.

(i) "Blowing tap" means any tap in which an evolution of gas forces or projects jets of flame or metal sparks beyond the ladle, runner, or collection hood.

(j) "Furnace power input" means the resistive electrical power consumption of an electric submerged arc furnace as measured in kilowatts.

(k) "Dust-handling equipment" means any equipment used to handle particulate matter collected by the air pollution control device (and located at or near such device) serving any electric submerged arc furnace subject to this subpart.

(l) "Control device" means the air pollution control equipment used to remove particulate matter generated by an electric submerged arc furnace from an effluent gas stream.

(m) "Capture system" means the equipment (including hoods, ducts, fans, dampers, etc.) used to capture or transport particulate matter generated by an affected electric submerged arc furnace to the control device.

(n) "Standard ferromanganese" means that alloy as defined by A.S.T.M. designation A99-66.

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(o) "Silicomanganese" means that alloy as defined by A.S.T.M. designation A483-66.

(p) "Calcium carbide" means material containing 70 to 85 percent calcium carbide by weight.

(q) "High-carbon ferrochrome" means that alloy as defined by A.S.T.M. designation A101-66 grades HC1 through HC6.

(r) "Charge chrome" means that alloy containing 52 to 70 percent by weight chromium, 5 to 8 percent by weight carbon, and 3 to 6 percent by weight silicon.

(s) "Silvery iron" means any ferrosilicon, as defined by A.S.T.M. designation A100-69, which contains less than 30 percent silicon.

(t) "Ferrochrome silicon" means that alloy as defined by A.S.T.M. designation A482-66.

(u) "Silicomanganese zirconium" means that alloy containing 60 to 65 percent by weight silicon, 1.5 to 2.5 percent by weight calcium, 5 to 7 percent by weight zirconium, 0.75 to 1.25 percent by weight aluminum, 5 to 7 percent by weight manganese, and 2 to 3 percent by weight barium.

(v) "Calcium silicon" means that alloy as defined by A.S.T.M. designation A495-64.

(w) "Ferrosilicon" means that alloy as defined by A.S.T.M. designation A100-69 grades, A, B, C, D, and E which contains 50 or more percent by weight silicon.

(x) "Silicon metal" means any silicon alloy containing more than 96 percent silicon by weight.

(y) "Ferromanganese silicon" means that alloy containing 63 to 66 percent by weight manganese, 28 to 32 percent by weight silicon, and a maximum of 0.08 percent by weight carbon.

[41 FR 18501, May 4, 1976; 41 FR 20659, May 20, 1976]

§ 60.262 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any electric submerged arc furnace any gases which:

(1) Exit from a control device and contain particulate matter in excess of 0.45 kg/MW-hr (0.99 lb/MW-hr) while silicon metal, ferrosilicon, calcium silicon, or silicomanganese zirconium is being produced.

(2) Exit from a control device and contain particulate matter in excess of 0.23 kg/MW-hr (0.51 lb/MW-hr) while highcarbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese, calcium carbide, ferrochrome silicon, ferromanganese silicon, or silvery iron is being produced.

(3) Exit from a control device and exhibit 15 percent opacity or greater.

(4) Exit from an electric submerged arc furnace and escape the capture system and are visible without the aid of instruments. The requirements under this subparagraph apply only during periods when flow rates are being established under § 60.265(d).

(5) Escape the capture system at the tapping station and are visible without the aid of instruments for more than 40 percent of each tapping period. There are no limitations on visible emissions under this subparagraph when a blowing tap occurs. The requirements under this subparagraph apply only during periods when flow rates are being established under § 60.265(d).

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any dust-handling equipment any gases which exhibit 10 percent opacity or greater.

§ 60.263 Standard for carbon monoxide.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged in to the atmosphere from any electric submerged arc furnace any gases which contain, on a dry basis, 20 or greater volume percent of carbon monoxide. Combustion of such gases under conditions acceptable to the Administrator constitutes compliance with this section. Acceptable con-

ditions include, but are not limited to, flaring of gases or use of gases as fuel for other processes.

§ 60.264 Emission monitoring.

(a) The owner or operator subject to the provisions of this subpart shall install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions discharged into the atmosphere from the control device(s).

(b) For the purpose of reports required under § 60.7(c), the owner or operator shall report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater.

(c) The owner or operator subject to the provisions of this subpart shall submit a written report of any product change to the Administrator. Reports of product changes must be postmarked not later than 30 days after implementation of the product change.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 18501, May 4, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.265 Monitoring of operations.

(a) The owner or operator of any electric submerged arc furnace subject to the provisions of this subpart shall maintain daily records of the following information:

(1) Product being produced.

(2) Description of constituents of furnace charge, including the quantity, by weight.

(3) Time and duration of each tapping period and the identification of material tapped (slag or product.)

(4) All furnace power input data obtained under paragraph (b) of this section.

(5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.

(b) The owner or operator subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input. The furnace power input may be measured at the output or input side of the transformer. The device must have an accuracy of ±5 percent over its operating range.

(c) The owner or operator subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted hood of the capture system, except as provided under paragraph (e) of this section. The owner or operator of an electric submerged arc furnace that is equipped with a water cooled cover which is designed to contain and prevent escape of the generated gas and particulate matter shall monitor only the volumetric flow rate through the capture system for control of emissions from the tapping station. The owner or operator may install the monitoring device(s) in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device must have an accuracy of ±10 percent over its normal operating range and must be calibrated according to the manufacturer's instructions. The Administrator may require the owner or operator to demonstrate the accuracy of the monitoring device relative to Methods 1 and 2 of Appendix A to this part.

(d) When performance tests are conducted under the provisions of § 60.8 of this part to demonstrate compliance with the standards under §§ 60.262(a)(4) and (5), the volumetric flow rate through each separately ducted hood of the capture system must be determined using the monitoring device required under paragraph (c) of this section. The volumetric flow rates must be determined for furnace power input levels at 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the volumetric flow rate at or above the appropriate levels for that furnace power input level determined during the most recent performance test. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator

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shall maintain the exhaust flow rates through the capture system over the tapping station at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests under § 60.8 of this part.

(e) The owner or operator may as an alternative to paragraph (c) of this section determine the volumetric flow rate through each fan of the capture system from the fan power consumption, pressure drop across the fan and the fan performance curve. Only data specific to the operation of the affected electric submerged arc furnace are acceptable for demonstration of compliance with the requirements of this paragraph. The owner or operator shall maintain on file a permanent record of the fan performance curve (prepared for a specific temperature) and shall:

(1) Install, calibrate, maintain, and operate a device to continuously measure and record the power consumption of the fan motor (measured in kilowatts), and

(2) Install, calibrate, maintain, and operate a device to continuously measure and record the pressure drop across the fan. The fan power consumption and pressure drop measurements must be synchronized to allow real time comparisions of the data. The monitoring devices must have an accuracy of ±5 percent over their normal operating ranges.

(f) The volumetric flow rate through each fan of the capture system must be determined from the fan power consumption, fan pressure drop, and fan performance curve specified under paragraph (e) of this section, during any performance test required under § 60.8 to demonstrate compliance with the standards under §§ 60.262(a)(4) and (5). The owner or operator shall determine the volumetric flow rate at a representative temperature for furnace power input levels of 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test for that furnace power input level. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests under § 60.8. The Administrator may require the owner or operator to verify the fan performance curve by monitoring necessary fan operating parameters and determining the gas volume moved relative to Methods 1 and 2 of Appendix A to this part.

(g) All monitoring devices required under paragraphs (c) and (e) of this section are to be checked for calibration annually in accordance with the procedures under § 60.13(b).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 18501, May 4, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.266 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.262 and § 60.263 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content except that the heating systems specified in paragraphs 2.1.2 and 2.1.4 of Method 5 are not to be used when the carbon monoxide content of the gas stream exceeds 10 percent by volume, dry basis.

(2) Method 1 for sample and velocity traverses.

(3) Method 2 for velocity and volumetric flow rate.

(4) Method 3 for gas analysis, including carbon monoxide.

(b) For Method 5, the sampling time for each run is to include an integral number of furnace cycles. The sampling time for each run must be at least 60 minutes and the minimum sample volume must be 1.8 dscm (64 dscf) when sampling emissions from open electric submerged arc furnaces with wet scrubber control devices, sealed electric submerged arc furnaces, or semi-enclosed electric submerged arc furnaces. When sampling emissions from other types of installations, the sampling time for each run must be at least 200 minutes and the minimum sample volume must be 5.7 dscm (200 dscf). Shorter sampling times or smaller sampling volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) During the performance test, the owner or operator shall record the maximum open hood area (in hoods with segmented or otherwise moveable sides) under which the process is expected to be operated and remain in compliance with all standards. Any future operation of the hooding system with open areas in excess of the maximum is not permitted.

(d) The owner or operator shall construct the control device so that volumetric flow rates and particulate matter emissions can be accurately determined by applicable test methods and procedures.

(e) During any performance test required under § 60.8, the owner or operator shall not allow gaseous diluents to be added to the effluent gas stream after the fabric in an open pressurized fabric filter collector unless the total gas volume flow from the collector is accurately determined and considered in the determination of emissions.

(f) When compliance with § 60.263 is to be attained by combusting the gas stream in a flare, the location of the sampling site for particulate matter is to be upstream of the flare.

(g) For each run, particulate matter emissions, expressed in kg/hr (lb/hr), must be determined for each exhaust stream at which emissions are quantified using the following equation:

$$E_n = C_s Q_s$$

where:

E_n = Emissions of particulate matter in kg/hr (lb/hr).

C_s = Concentration of particulate matter in kg/dscm (lb/dscf) as determined by Method 5.

Q_s = Volumetric flow rate of the effluent gas stream in dscm/hr (dscf/hr) as determined by Method 2.

(h) For Method 5, particulate matter emissions from the affected facility, expressed in kg/MW-hr (lb/MW-hr) must be determined for each run using the following equation:

$$E = \frac{\sum_{n=1}^{N} E_n}{p}$$

where:

E = Emissions of particulate from the affected facility, in kg/MW-hr (lb/MW-hr).

N = Total number of exhaust streams at which emissions are quantified.

E_n = Emissions of particulate matter from each exhaust stream in kg/hr (lb/hr), as determined in paragraph (g) of this section.

p = Average furnace power input during the sampling period, in megawatts as determined according to § 60.265(b).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 18501, May 4, 1976; 41 FR 20659, May 20, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

SOURCE: 40 FR 43852, Sept. 23, 1975, unless otherwise noted.

§ 60.270 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in steel plants: Electric arc furnaces and dust-handling equipment.

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(b) Any facility under paragraph (a) of this section that commences construction or modification after October 21, 1974, is subject to the requirements of this subpart.

(Secs. 111, 301(a), Clean Air Act; sec. 4(a) of Pub. L. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. 90-148, 81 Stat. 504 (42 U.S.C. 1857c-6, 1857g(a)))

[42 FR 37938, July 25, 1977; 42 FR 44812, Sept. 7, 1977]

§ 60.271 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Electric arc furnace" (EAF) means any furnace that produces molten steel and heats the charge materials with electric arcs from carbon electrodes. Furnaces from which the molten steel is cast into the shape of finished products, such as in a foundary, are not affected facilities included within the scope of this definition. Furnaces which, as the primary source of iron, continuously feed prereduced ore pellets are not affected facilities within the scope of this definition.

(b) "Dust-handling equipment" means any equipment used to handle particulate matter collected by the control device and located at or near the control device for an EAF subject to this subpart.

(c) "Control device" means the air pollution control equipment used to remove particulate matter generated by an EAF(s) from the effluent gas stream.

(d) "Capture system" means the equipment (including ducts, hoods, fans, dampers, etc.) used to capture or transport particulate matter generated by an EAF to the air pollution control device.

(e) "Charge" means the addition of iron and steel scrap or other materials into the top of an electric arc furnace.

(f) "Charging period" means the time period commencing at the moment an EAF starts to open and ending either three minutes after the EAF roof is returned to its closed position or six minutes after commencement of opening of the roof, whichever is longer.

(g) "Tap" means the pouring of molten steel from an EAF.

(h) "Tapping period" means the time period commencing at the moment an EAF begins to tilt to pour and ending either three minutes after an EAF returns to an upright position or six minutes after commencing to tilt, whichever is longer.

(i) "Meltdown and refining" means that phase of the steel production cycle when charge material is melted and undesirable elements are removed from the metal.

(j) "Meltdown and refining period" means the time period commencing at the termination of the initial charging period and ending at the initiation of the tapping period, excluding any intermediate charging periods.

(k) "Shop opacity" means the arithmetic average of 24 or more opacity observations of emissions from the shop taken in accordance with Method 9 of Appendix A of this part for the applicable time periods.

(l) "Heat time" means the period commencing when scrap is charged to an empty EAF and terminating when the EAF tap is completed.

(m) "Shop" means the building which houses one or more EAF's.

(n) "Direct shell evacuation system" means any system that maintains a negative pressure within the EAF above the slag or metal and ducts these emissions to the control device.

§ 60.272 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from an electric arc furnace any gases which:

(1) Exit from a control device and contain particulate matter in excess of 12 mg/dscm (0.0052 gr/dscf).

(2) Exit from a control device and exhibit three percent opacity or greater.

(3) Exit from a shop and, due solely to operations of any EAF(s), exhibit greater than zero percent shop opacity except:

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(i) Shop opacity greater than zero percent, but less than 20 percent, may occur during charging periods.

(ii) Shop opacity greater than zero percent, but less than 40 percent, may occur during tapping periods.

(iii) Opacity standards under paragraph (a)(3) of this section shall apply only during periods when flow rates and pressures are being established under § 60.274(c) and (f).

(iv) Where the capture system is operated such that the roof of the shop is closed during the charge and the tap, and emissions to the atmosphere are prevented until the roof is opened after completion of the charge or tap, the shop opacity standards under paragraph (a)(3) of this section shall apply when the roof is opened and shall continue to apply for the length of time defined by the charging and/or tapping periods.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from dust-handling equipment any gases which exhibit 10 percent opacity or greater.

§ 60.273 Emission monitoring.

(a) A continuous monitoring system for the measurement of the opacity of emissions discharged into the atmosphere from the control device(s) shall be installed, calibrated, maintained, and operated by the owner or operator subject to the provisions of this subpart.

(b) For the purpose of reports under § 60.7(c), periods of excess emissions that shall be reported are defined as all six-minute periods during which the average opacity is three percent or greater.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 43852, Sept. 23, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.274 Monitoring of operations.

(a) The owner or operator subject to the provisions of this subpart shall maintain records daily of the following information:

(1) Time and duration of each charge;

(2) Time and duration of each tap;

(3) All flow rate data obtained under paragraph (b) of this section, or equivalent obtained under paragraph (d) of this section; and

(4) All pressure data obtained under paragraph (e) of this section.

(b) Except as provided under paragraph (d) of this section, the owner or operator subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously records the volumetric flow rate through each separately ducted hood. The monitoring device(s) may be installed in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device(s) shall have an accuracy of ±10 percent over its normal operating range and shall be calibrated according to the manufacturer's instructions. The Administrator may require the owner or operator to demonstrate the accuracy of the monitoring device(s) relative to Methods 1 and 2 of Appendix A of this part.

(c) When the owner or operator of an EAF is required to demonstrate compliance with the standard under § 60.272(a)(3) and at any other time the Administrator may require (under section 114 of the Act, as amended), the volumetric flow rate through each separately ducted hood shall be determined during all periods in which the hood is operated for the purpose of capturing emissions from the EAF using the monitoring device under paragraph (b) of this section. The owner or operator may petition the Administrator for reestablishment of these flow rates whenever the owner or operator can demonstrate to the Administrator's satisfaction that the EAF operating conditions upon which the flow rates were previously established are no longer applicable. The flow rates determined during the most recent demonstration of compliance shall be maintained (or may be exceeded) at the appropriate level for each applicable period. Operation at lower flow rates may be considered by the Administrator to be unacceptable

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operation and maintenance of the affected facility.

(d) The owner or operator may petition the Administrator to approve any alternative method that will provide a continuous record of operation of each emission capture system.

(e) Where emissions during any phase of the heat time are controlled by use of a direct shell evacuation system, the owner or operator shall install, calibrate, and maintain a monitoring device that continuously records the pressure in the free space inside the EAF. The pressure shall be recorded as 15-minute integrated averages. The monitoring device may be installed in any appropriate location in the EAF such that reproducible results will be obtained. The pressure monitoring device shall have an accuracy of ±5 mm of water gauge over its normal operating range and shall be calibrated according to the manufacturer's instructions.

(f) When the owner or operator of an EAF is required to demonstrate compliance with the standard under § 60.272(a)(3) and at any other time the Administrator may require (under section 114 of the Act, as amended), the pressure in the free space inside the furnace shall be determined during the meltdown and refining period(s) using the monitoring device under paragraph (e) of this section. The owner or operator may petition the Administrator for reestablishment of the 15-minute integrated average pressure whenever the owner or operator can demonstrate to the Administrator's satisfaction that the EAF operating conditions upon which the pressures were previously established are no longer applicable. The pressure determined during the most recent demonstration of compliance shall be maintained at all times the EAF is operating in a meltdown and refining period. Operation at higher pressures may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility.

(g) Where the capture system is designed and operated such that all emissions are captured and ducted to a control device, the owner or operator shall not be subject to the requirements of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 43852, Sept. 23, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 60.275 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with the standards prescribed under § 60.272 as follows:

(1) Method 5 for concentration of particulate matter and associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least four hours. When a single EAF is sampled, the sampling time for each run shall also include an integral number of heats. Shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator. The minimum sample volume shall be 4.5 dscm (160 dscf).

(c) For the purpose of this subpart, the owner or operator shall conduct the demonstration of compliance with 60.272(a)(3) and furnish the Administrator a written report of the results of the test.

(d) During any performance test required under § 60.8 of this part, no gaseous diluents may be added to the effluent gas stream after the fabric in any pressurized fabric filter collector, unless the amount of dilution is separately determined and considered in the determination of emissions.

(e) When more than one control device serves the EAF(s) being tested, the concentration of particulate matter shall be determined using the following equation:

$$C_s = \frac{\sum_{n=1}^{N} (C_s Q_s)_n}{\sum_{n=1}^{N} (Q_s)_n}$$

where:

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C_s = concentration of particulate matter in mg/dscm (gr/dscf) as determined by method 5.
N = total number of control devices tested.
Q_s = volumetric flow rate of the effluent gas stream in dscm/hr (dscf/hr) as determined by method 2.
$(C_sQ_s)_n$ or $(Q_s)_n$ = value of the applicable parameter for each control device tested.

(f) Any control device subject to the provisions of this subpart shall be designed and constructed to allow measurement of emissions using applicable test methods and procedures.

(g) Where emissions from any EAF(s) are combined with emissions from facilities not subject to the provisions of this subpart but controlled by a common capture system and control device, the owner or operator may use any of the following procedures during a performance test:

(1) Base compliance on control of the combined emissions.

(2) Utilize a method acceptable to the Administrator which compensates for the emissions from the facilities not subject to the provisions of this subpart.

(3) Any combination of the criteria of paragraphs (g)(1) and (g)(2) of this section.

(h) Where emissions from any EAF(s) are combined with emissions from facilities not subject to the provisions of this subpart, the owner or operator may use any of the following procedures for demonstrating compliance with § 60.272(a)(3):

(1) Base compliance on control of the combined emissions.

(2) Shut down operation of facilities not subject to the provisions of this subpart.

(3) Any combination of the criteria of paragraphs (h)(1) and (h)(2) of this section.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 43852, Sept. 23, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart BB—Standards of Performance for Kraft Pulp Mills

AUTHORITY: Secs. 111, 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

SOURCE: 43 FR 7572, Feb. 23, 1978, unless otherwise noted.

§ 60.280 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in kraft pulp mills: digester system, brown stock washer system, multiple-effect evaporator system, black liquor oxidation system, recovery furnace, smelt dissolving tank, lime kiln, and condensate stripper system. In pulp mills where kraft pulping is combined with neutral sulfite semichemical pulping, the provisions of this subpart are applicable when any portion of the material charged to an affected facility is produced by the kraft pulping operation.

(b) Any facility under paragraph (a) of this section that commences construction or modification after September 24, 1976, is subject to the requirements of this subpart.

§ 60.281 Definitions.

As used in this subpart, all terms not defined herein shall have the same meaning given them in the Act and in Subpart A.

(a) "Kraft pulp mill" means any stationary source which produces pulp from wood by cooking (digesting) wood chips in a water solution of sodium hydroxide and sodium sulfide (white liquor) at high temperature and pressure. Regeneration of the cooking chemicals through a recovery process is also considered part of the kraft pulp mill.

(b) "Neutral sulfite semichemical pulping operation" means any operation in which pulp is produced from wood by cooking (digesting) wood chips in a solution of sodium sulfite and sodium bicarbonate, followed by mechanical defibrating (grinding).

(c) "Total reduced sulfur (TRS)" means the sum of the sulfur compounds hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, that are released during the kraft pulping operation and measured by Reference Method 16.

(d) "Digester system" means each continuous digester or each batch digester used for the cooking of wood in white liquor, and associated flash

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tank(s), below tank(s), chip steamer(s), and condenser(s).

(e) "Brown stock washer system" means brown stock washers and associated knotters, vacuum pumps, and filtrate tanks used to wash the pulp following the digester system.

(f) "Multiple-effect evaporator system" means the multiple-effect evaporators and associated condenser(s) and hotwell(s) used to concentrate the spent cooking liquid that is separated from the pulp (black liquor).

(g) "Black liquor oxidation system" means the vessels used to oxidize, with air or oxygen, the black liquor, and associated storage tank(s).

(h) "Recovery furnace" means either a straight kraft recovery furnace or a cross recovery furnace, and includes the direct-contact evaporator for a direct-contact furnace.

(i) "Straight kraft recovery furnace" means a furnace used to recover chemicals consisting primarily of sodium and sulfur compounds by burning black liquor which on a quarterly basis contains 7 weight percent or less of the total pulp solids from the neutral sulfite semichemical process or has green liquor sulfidity of 28 percent or less.

(j) "Cross recovery furnace" means a furnace used to recover chemicals consisting primarily of sodium and sulfur compounds by burning black liquor which on a quarterly basis contains more than 7 weight percent of the total pulp solids from the neutral sulfite semichemical process and has a green liquor sulfidity of more than 28 percent.

(k) "Black liquor solids" means the dry weight of the solids which enter the recovery furnace in the black liquor.

(l) "Green liquor sulfidity" means the sulfidity of the liquor which leaves the smelt dissolving tank.

(m) "Smelt dissolving tank" means a vessel used for dissolving the smelt collected from the recovery furnace.

(n) "Lime kiln" means a unit used to calcine lime mud, which consists primarily of calcium carbonate, into quicklime, which is calcium oxide.

(o) "Condensate stripper system" means a column, and associated condensers, used to strip, with air or steam, TRS compounds from condensate streams from various processes within a kraft pulp mill.

§ 60.282 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any recovery furnace any gases which:

(i) Contain particulate matter in excess of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen.

(ii) Exhibit 35 percent opacity or greater.

(2) From any smelt dissolving tank any gases which contain particulate matter in excess of 0.1 g/kg black liquor solids (dry weight)[0.2 lb/ton black liquor solids (dry weight)].

(3) From any lime kiln any gases which contain particulate matter in excess of:

(i) 0.15 g/dscm (0.067 gr/dscf) corrected to 10 percent oxygen, when gaseous fossil fuel is burned.

(ii) 0.30 g/dscm (0.13 gr/dscf) corrected to 10 percent oxygen, when liquid fossil fuel is burned.

§ 60.283 Standard for total reduced sulfur (TRS).

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any digester system, brown stock washer system, multiple-effect evaporator system, black liquor oxidation system, or condensate stripper system any gases which contain TRS in excess of 5 ppm by volume on a dry basis, corrected to 10 percent oxygen, unless the following conditions are met:

(i) The gases are combusted in a lime kiln subject to the provisions of paragraph (a)(5) of this section; or

(ii) The gases are combusted in a recovery furnace subject to the provisions of paragraphs (a)(2) or (a)(3) of this section; or

(iii) The gases are combusted with other waste gases in an incinerator or other device, or combusted in a lime kiln or recovery furnace not subject to the provisions of this subpart, and are subjected to a minimum temperature of 1200° F. for at least 0.5 second; or

(iv) It has been demonstrated to the Administrator's satisfaction by the owner or operator that incinerating the exhaust gases from a new, modified, or reconstructed black liquor oxidation system or brown stock washer system in an existing facility is technologically or economically not feasible. Any exempt system will become subject to the provisions of this subpart if the facility is changed so that the gases can be incinerated.

(v) The gases from the digester system, brown stock washer system, condensate stripper system, or black liquor oxidation system are controlled by a means other than combustion. In this case, these systems shall not discharge any gases to the atmosphere which contain TRS in excess of 5 ppm by volume on a dry basis, corrected to the actual oxygen content of the untreated gas stream.

(2) From any straight kraft recovery furnace any gases which contain TRS in excess of 5 ppm by volume on a dry basis, corrected to 8 percent oxygen.

(3) From any cross recovery furnace any gases which contain TRS in excess of 25 ppm by volume on a dry basis, corrected to 8 percent oxygen.

(4) From any smelt dissolving tank any gases which contain TRS in excess of 0.0084 g/kg black liquor solids (dry weight) [0.0168 lb/ton liquor solids (dry weight)].

(5) From any lime kiln any gases which contain TRS in excess of 8 ppm by volume on a dry basis, corrected to 10 percent oxygen.

[43 FR 7572, Feb. 23, 1978, as amended at 43 FR 34785, Aug. 7, 1978]

§ 60.284 Monitoring of emissions and operations.

(a) Any owner or operator subject to the provisions of this subpart shall install, calibrate, maintain, and operate the following continuous monitoring systems:

(1) A continuous monitoring system to monitor and record the opacity of the gases discharged into the atmosphere from any recovery furnace. The span of this system shall be set at 70 percent opacity.

(2) Continuous monitoring systems to monitor and record the concentration of TRS emissions on a dry basis and the percent of oxygen by volume on a dry basis in the gases discharged into the atmosphere from any lime kiln, recovery furnace, digester system, brown stock washer system, multiple-effect evaporator system, black liquor oxidation system, or condensate stripper system, except where the provisions of § 60.283(a)(1) (iii) or (iv) apply. These systems shall be located downstream of the control device(s) and the span(s) of these continuous monitoring system(s) shall be set:

(i) At a TRS concentration of 30 ppm for the TRS continuous monitoring system, except that for any cross recovery furnace the span shall be set at 50 ppm.

(ii) At 20 percent oxygen for the continuous oxygen monitoring system.

(b) Any owner or operator subject to the provisions of this subpart shall install, calibrate, maintain, and operate the following continuous monitoring devices:

(1) A monitoring device which measures the combustion temperature at the point of incineration of effluent gases which are emitted from any digester system, brown stock washer system, multiple-effect evaporator system, black liquor oxidation system, or condensate stripper system where the provisions of § 60.283(a)(1)(iii) apply. The monitoring device is to be certified by the manufacturer to be accurate within ±1 percent of the temperature being measured.

(2) For any lime kiln or smelt dissolving tank using a scrubber emission control device:

(i) A monitoring device for the continuous measurement of the pressure loss of the gas stream through the control equipment. The monitoring device is to be certified by the manufacturer to be accurate to within a gage pressure of ±500 pascals (ca. ±2 inches water gage pressure).

(ii) A monitoring device for the continuous measurement of the scrubbing

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liquid supply pressure to the control equipment. The monitoring device is to be certified by the manufacturer to be accurate within ±15 percent of design scrubbing liquid supply pressure. The pressure sensor or tap is to be located close to the scrubber liquid discharge point. The Administrator may be consulted for approval of alternative locations.

(c) Any owner or operator subject to the provisions of this subpart shall, except where the provisions of § 60.283(a)(1)(iv) or § 60.283(a)(4) apply.

(1) Calculate and record on a daily basis 12-hour average TRS concentrations for the two consecutive periods of each operating day. Each 12-hour average shall be determined as the arithmetic mean of the appropriate 12 contiguous 1-hour average total reduced sulfur concentrations provided by each continuous monitoring system installed under paragraph (a)(2) of this section.

(2) Calculate and record on a daily basis 12-hour average oxygen concentrations for the two consecutive periods of each operating day for the recovery furnace and lime kiln. These 12-hour averages shall correspond to the 12-hour average TRS concentrations under paragraph (c)(1) of this section and shall be determined as an arithmetic mean of the appropriate 12 contiguous 1-hour average oxygen concentrations provided by each continuous monitoring system installed under paragraph (a)(2) of this section.

(3) Correct all 12-hour average TRS concentrations to 10 volume percent oxygen, except that all 12-hour average TRS concentration from a recovery furnace shall be corrected to 8 volume percent using the following equation:

$$C_{corr} = C_{meas} \times (21 - X/21 - Y)$$

where:

C_{corr} = the concentration corrected for oxygen.

C_{meas} = the concentration uncorrected for oxygen.

X = the volumetric oxygen concentration in percentage to be corrected to (8 percent for recovery furnaces and 10 percent for lime kilns, incinerators, or other devices).

Y = the measured 12-hour average volumetric oxygen concentration.

(d) For the purpose of reports required under § 60.7(c), any owner or operator subject to the provisions of this subpart shall report periods of excess emissions as follows:

(1) For emissions from any recovery furnace periods of excess emissions are:

(i) All 12-hour averages of TRS concentrations above 5 ppm by volume for straight kraft recovery furnaces and above 25 ppm by volume for cross recovery furnaces.

(ii) All 6-minute average opacities that exceed 35 percent.

(2) For emissions from any lime kiln, periods of excess emissions are all 12-hour average TRS concentration above 8 ppm by volume.

(3) For emissions from any digester system, brown stock washer system, multiple-effect evaporator system, black liquor oxidation system, or condensate stripper system periods of excess emissions are:

(i) All 12-hour average TRS concentrations above 5 ppm by volume unless the provisions of § 60.283(a)(1) (i), (ii), or (iv) apply; or

(ii) All periods in excess of 5 minutes and their duration during which the combustion temperature at the point of incineration is less than 1200° F. where the provisions of § 60.283(a)(1)(ii) apply.

(e) The Administrator will not consider periods of excess emissions reported under paragraph (d) of this section to be indicative of a violation of § 60.11(d) provided that:

(1) The percent of the total number of possible contiguous periods of excess emissions in a quarter (excluding periods of startup, shutdown, or malfunction and periods when the facility is not operating) during which excess emissions occur does not exceed:

(i) One percent for TRS emissions from recovery furnaces.

(ii) Six percent for average opacities from recovery furnaces.

(2) The Administrator determines that the affected facility, including air pollution control equipment, is maintained and operated in a manner

which is consistent with good air pollution control practice for minimizing emissions during periods of excess emissions.

§ 60.285 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with § 60.282(a) as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) When determining compliance with § 60.282(a)(2), Method 2 for velocity and volumetric flow rate,

(4) Method 3 for gas analysis, and

(5) Method 9 for visible emissions.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.85 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator. Water shall be used as the cleanup solvent instead of acetone in the sample recovery procedure outlined in Method 5.

(c) Method 17 (in-stack filtration) may be used as an alternate method for Method 5 for determining compliance with § 60.282(a)(1)(i): *Provided*, That a constant value of 0.009 g/dscm (0.004 gr/dscf) is added to the results of Method 17 and the stack temperature is no greater than 205° C (ca. 400° F). Water shall be used as the cleanup solvent instead of acetone in the sample recovery procedure outlined in Method 17.

(d) For the purpose of determining compliance with § 60.283(a) (1), (2), (3), (4), and (5), the following reference methods shall be used:

(1) Method 16 for the concentration of TRS,

(2) Method 3 for gas analysis, and

(3) When determining compliance with § 60.283(a)(4), use the results of Method 2, Method 16, and the black liquor solids feed rate in the following equation to determine the TRS emission rate.

$$E = (C_{H_2S}F_{H_2S} + C_{MeSH}F_{MeSH} + C_{DMS}F_{dms} + C_{DMDS}F_{DMDS})(Q_{sd})/BLS$$

where:

E = mass of TRS emitted per unity of black liquor solids (g/kg) (lb/ton)

C_{H_2S} = average concentration of hydrogen sulfide (H_2S) during the test period, PPM.

C_{MeSH} = average concentration of methyl mercaptan (MeSH) during the test period, PPM.

C_{DMS} = average concentration of dimethyl sulfide (DMS) during the test period, PPM.

C_{DMDS} = average concentration of dimethyl disulfide (DMDS) during the test period, PPM.

F_{H_2S} = 0.001417 g/m³ PPM for metric units
= 0.08844 lb/ft³ PPM for English units

F_{MeSH} = 0.00200 g/m³ PPM for metric units
= 0.1248 lb/ft³ PPM for English units

F_{DMS} = 0.002583 g/m³ PPM for metric units
= 0.1612 lb/ft³ PPM for English units

F_{DMDS} = 0.003917 g/m³ PPM for metric units
= 0.2445 lb/ft³ PPM for English units

Q_{sd} = dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr)

BLS = black liquor solids feed rate, kg/hr (lb/hr)

(4) When determining whether a furnace is straight kraft recovery furnace or a cross recovery furnace, TAPPI Method T.624 shall be used to determine sodium sulfide, sodium hydroxide and sodium carbonate. These determinations shall be made three times daily from the green liquor and the daily average values shall be converted to sodium oxide (Na_2O) and substituted into the following equation to determine the green liquor sulfidity:

$$GLS = 100\ C_{Na_2S}/C_{Na_2S} + C_{NaOH} + C_{Na_2CO_3}$$

where:

GLS = percent green liquor sulfidity

C_{Na_2S} = average concentration of Na_2S expressed as Na_2O (mg/1)

C_{NaOH} = average concentration of $NaOH$ expressed as Na_2O (mg/1)

$C_{Na_2CO_3}$ = average concentration of Na_2CO_3 expressed as Na_2O (mg/1)

(e) All concentrations of particulate matter and TRS required to be measured by this section from lime kilns or incinerators shall be corrected 10 volume percent oxygen and those concentrations from recovery furnaces shall be corrected to 8 volume percent oxygen. These corrections shall be made in the manner specified in § 60.284(c)(3).

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Subpart CC—Standards of Performance for Glass Manufacturing Plants

AUTHORITY: Secs. 111 and 301(a). Clean Air Act, as amended, (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

SOURCE: 45 FR 66751, Oct. 7, 1980, unless otherwise noted.

§ 60.290 Applicability and designation of affected facility.

(a) Each glass melting furnace is an affected facility to which the provisions of this subpart apply.

(b) Any facility under paragraph (a) of this section that commences construction or modification after June 15, 1979, is subject to the requirements of this subpart.

(c) This subpart does not apply to hand glass melting furnaces, glass melting furnaces designed to produce less than 4,550 kilograms of glass per day and all-electric melters.

§ 60.291 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part, unless otherwise required by the context.

"All-electric melter" means a glass melting furnace in which all the heat required for melting is provided by electric current from electrodes submerged in the molten glass, although some fossil fuel may be charged to the furnace as raw material only.

"Borosilicate Recipe" means raw material formulation of the following approximately weight proportions: 72 percent silica; 7 percent nepheline syenite; 13 percent anhydrous borax; 8 percent boric acid; and 0.1 percent miscellaneous materials.

"Container glass" means glass made of soda-lime recipe, clear or colored, which is pressed and/or blown into bottles, jars, ampoules, and other products listed in Standard Industrial Classification 3221 (SIC 3221).

"Flat glass" means glass made of soda-lime recipe and produced into continuous flat sheets and other products listed in SIC 3211.

"Glass melting furnace" means a unit comprising a refractory vessel in which raw materials are charged, melted at high temperature, refined, and conditioned to produce molten glass. The unit includes foundations, superstructure and retaining walls, raw material charger systems, heat exchangers, melter cooling system, exhaust system, refractory brick work, fuel supply and electrical boosting equipment, integral control systems and instrumentation, and appendages for conditioning and distributing molten glass to forming apparatuses. The forming apparatuses, including the float bath used in flat glass manufacturing, are not considered part of the glass melting furnace.

"Glass produced" means the weight of the glass pulled from the glass melting furnace.

"Hand glass melting furnace" means a glass melting furnace where the molten glass is removed from the furnace by a glassworker using a blowpipe or a pontil.

"Lead recipe" means raw material formulation of the following approximate weight proportions: 56 percent silica; 8 percent potassium carbonate; and 36 percent red lead.

"Pressed and blown glass" means glass which is pressed, blown, or both, including textile fiberglass, noncontinuous flat glass, noncontainer glass, and other products listed in SIC 3229. It is separated into:

(1) Glass of borosilicate recipe.

(2) Glass of soda-lime and lead recipes.

(3) Glass of opal, fluoride, and other recipes.

"Rebricking" means cold replacement of damaged or worn refractory parts of the glass melting furnace. Rebricking includes replacement of the refractories comprising the bottom, sidewalls, or roof of the melting vessel; replacement of refractory work in the heat exchanger; replacment of refractory portions of the glass conditioning and distribution system.

"Soda-lime recipe" means raw material formulation of the following approximate weight proportions: 72 percent silica; 15 percent soda; 10 percent lime and magnesia; 2 percent alumina;

and 1 percent miscellaneous materials (including sodium sulfate).

"Wool fiberglass" means fibrous glass of random texture, including fiberglass insulation, and other products listed in SIC 3296.

§ 60.292 Standards for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator of a glass melting furnace subject to the provisions of this subpart shall cause to be discharged into the atmosphere—

(1) From any glass melting furnace fired exclusively with either a gaseous fuel or a liquid fuel, particulate matter at emission rates exceeding those specified in Table CC-1, Column 2 and Column 3, respectively, or

(2) From any glass melting furnace, fired simultaneously with gaseous and liquid fuels, particulate matter at emission rates exceeding STD as specified by the following equation:

$STD = X\ [1.3(Y) + (Z)]$

Where:

STD = Particulate matter emission limit, g of particulate/kg of glass produced.

X = Emission rate specified in Table CC-1 for furnaces fired with gaseous fuel (Column 2).

Y = Decimal percent of liquid fuel heating value to total (gaseous and liquid) fuel heating value fired in the glass melting furnaces as determined in § 60.296(f). (joules/joules).

Z = (1-Y).

(b) Conversion of a glass melting furnace to the use of liquid fuel is not considered a modification for the purposes of § 60.14.

(c) Rebricking and the cost of rebricking is not considered a reconstruction for the purposes of § 60.15.

Table CC-11—*Emission Rates*

[g of particulate/kg of glass produced]

Col. 1—Glass manufacturing plant industry segment	Col. 2—Furnace fired with gaseous fuel	Col. 3—Furnace fired with liquid fuel
Container glass	0.1	0.13
Pressed and blown glass		
(a) Borosilicate Recipes	0.5	0.65
(b) Soda-Lime and Lead Recipes	0.1	0.13
(c) Other-Than Borosilicate, Soda-Lime, and Lead Recipes (including opal, fluoride, and other recipes)	0.25	0.325
Wool fiberglass	0.25	0.325
Flat glass	0.225	0.225

§§ 60.293–60.295 [Reserved]

§ 60.296 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with § 60.292 as follows:

(1) Method 1 shall be used for sample and velocity traverses, and

(2) Method 2 shall be used to determine velocity and volumetric flow rate.

(3) Method 3 shall be used for gas analysis.

(4) Method 5 shall be used to determine the concentration of particulate matter and the associated moisture content.

(b) For Method 5, the probe and filter holder heating systen in the sampling train shall be set to provide a gas temperature no greater than 177° C. The sampling time for each run shall be at least 60 minutes and the collected particulate shall weigh at least 50 mg.

(c) The particulate emission rate, E, shall be computed as follows:

$E = Q \times C$

Where:

(1) E is the particulate emission rate (g/hr)

(2) Q is the average volumetric flow rate (dscm/hr) as found from Method 2

(3) C is the average concentration (g/dscm) of particulate matter as found from the modified Method 5

(d) The rate of glass produced, P (kg/hr), shall be determined by dividing the weight of glass pulled in kilo-

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grams (kg) from the affected facility during the performance test by the number of hours (hr) taken to perform the performance test. The glass pulled, in kilograms, shall be determined by direct measurement or computed from materials balance by good engineering practice.

(e) For the purposes of these standards the furnace emission rate shall be computed as follows:

$R = E - A \div P$

Where:

(1) R is the furnace emission rate (g/kg)

(2) E is the particulate emission rate (g/hr) from (c) above

(3) A is the zero production rate correction;
A is 227 g/hr for container glass, pressed and blown (soda-lime and lead) glass, and pressed and blown (other-than borosilicate, soda-lime, and lead) glass
A is 454 g/hr for pressed and blown (borosilicate) glass, wool fiberglass, and flat glass

(4) P is the rate of glass production (kg/hr) from (d) above

(f) When gaseous and liquid fuels are fired simultaneously in a glass melting furnace, the heat input of each fuel, expressed in joules, is determined during each testing period by multiplying the gross calorific value of each fuel fired (in joules/kilogram) by the rate of each fuel fired (in kilograms/second) to the glass melting furnaces. The decimal percent of liquid fuel heating value to total fuel heating value is determined by dividing the heat input of the liquid fuels by the sum of the heat input for the liquid fuels and the gaseous fuels. Gross calorific values are determined in accordance with American Society of Testing and Materials (A.S.T.M.) Method D 240-64(73) (liquid fuels) and D 1826-64(7) (gaseous fuels), as applicable. The owner or operator shall determine the rate of fuels burned during each testing period by suitable methods and shall confirm the rate by a material balance over the glass melting system. [Section 114 of Clean Air Act, as amended (42 U.S.C. 7414).]

Subpart DD—Standards of Performance for Grain Elevators

AUTHORITY: Secs. 111 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

SOURCE: 43 FR 34347, Aug. 3, 1978, unless otherwise noted.

§ 60.300 Applicability and designation of affected facility.

(a) The provisions of this subpart apply to each affected facility at any grain terminal elevator or any grain storage elevator, except as provided under § 60.304(b). The affected facilities are each truck unloading station, truck loading station, barge and ship unloading station, barge and ship loading station, railcar loading station, railcar unloading station, grain dryer, and all grain handling operations.

(b) Any facility under paragraph (a) of this section which commences construction, modification, or reconstruction after (date of reinstatement of proposal) is subject to the requirements of this part.

§ 60.301 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the act and in subpart A of this part.

(a) "Grain" means corn, wheat, sorghum, rice, rye, oats, barley, and soybeans.

(b) "Grain elevator" means any plant or installation at which grain is unloaded, handled, cleaned, dried, stored, or loaded.

(c) "Grain terminal elevator" means any grain elevator which has a permanent storage capacity of more than 88,100 m^3 (ca. 2.5 million U.S. bushels), except those located at animal food manufacturers, pet food manufacturers, cereal manufacturers, breweries, and livestock feedlots.

(d) "Permanent storage capacity" means grain storage capacity which is inside a building, bin, or silo.

(e) "Railcar" means railroad hopper car or boxcar.

(f) "Grain storage elevator" means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant which has a permanent grain storage capacity of 35,200 m^3 (ca. 1 million bushels).

(g) "Process emission" means the particulate matter which is collected by a capture system.

(h) "Fugitive emission" means the particulate matter which is not collected by a capture system and is released directly into the atmosphere from an affected facility at a grain elevator.

(i) "Capture system" means the equipment such as sheds, hoods, ducts, fans, dampers, etc. used to collect particulate matter generated by an affected facility at a grain elevator.

(j) "Grain unloading station" means that portion of a grain elevator where the grain is transferred from a truck, railcar, barge, or ship to a receiving hopper.

(k) "Grain loading station" means that portion of a grain elevator where the grain is transferred from the elevator to a truck, railcar, barge, or ship.

(l) "Grain handling operations" include bucket elevators or legs (excluding legs used to unload barges or ships), scale hoppers and surge bins (garners), turn heads, scalpers, cleaners, trippers, and the headhouse and other such structures.

(m) "Column dryer" means any equipment used to reduce the moisture content of grain in which the grain flows from the top to the bottom in one or more continuous packed columns between two perforated metal sheets.

(n) "Rack dryer" means any equipment used to reduce the moisture content of grain in which the grain flows from the top to the bottom in a cascading flow around rows of baffles (racks).

(o) "Unloading leg" means a device which includes a bucket-type elevator which is used to remove grain from a barge or ship.

§ 60.302 Standard for particulate matter.

(a) On and after the 60th day of achieving the maximum production rate at which the affected facility will be operated, but no later than 180 days after initial startup, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere any gases which exhibit greater than 0 percent opacity from any:

(1) Column dryer with column plate perforation exceeding 2.4 mm diameter (ca. 0.094 inch).

(2) Rack dryer in which exhaust gases pass through a screen filter coarser than 50 mesh.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility except a grain dryer any process emission which:

(1) Contains particulate matter in excess of 0.023 g/dscm (ca. 0.01 gr/dscf).

(2) Exhibits greater than 0 percent opacity.

(c) On and after the 60th day of achieving the maximum production rate at which the affected facility will be operated, but no later than 180 days after initial startup, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere any fugitive emission from:

(1) Any individual truck unloading station, railcar unloading station, or railcar loading station, which exhibits greater than 5 percent opacity.

(2) Any grain handling operation which exhibits greater than 0 percent opacity.

(3) Any truck loading station which exhibits greater than 10 percent opacity.

(4) Any barge or ship loading station which exhibits greater than 20 percent opacity.

(d) The owner or operator of any barge or ship unloading station shall operate as follows:

(1) The unloading leg shall be enclosed from the top (including the receiving hopper) to the center line of the bottom pulley and ventilation to a control device shall be maintained on both sides of the leg and the grain receiving hopper.

(2) The total rate of air ventilated shall be at least 32.1 actual cubic meters per cubic meter of grain handling capacity (ca. 40 ft^3/bu).

(3) Rather than meet the requirements of subparagraphs (1) and (2), of this paragraph the owner or operator may use other methods of emission

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control if it is demonstrated to the Administrator's satisfaction that they would reduce emissions of particulate matter to the same level or less.

§ 60.303 Test methods and procedures.

(a) Reference methods in appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with the standards prescribed under § 60.302 as follows:

(1) Method 5 or method 17 for concentration of particulate matter and associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate;

(4) Method 3 for gas analysis; and

(5) Method 9 for visible emissions.

(b) For method 5, the sampling probe and filter holder shall be operated without heaters. The sampling time for each run, using method 5 or method 17, shall be at least 60 minutes. The minimum sample volume shall be 1.7 dscm (ca. 60 dscf).

(Sec. 114, Clean Air Act, as amended (42 U.S.C. 7414))

§ 60.304 Modifications.

(a) The factor 6.5 shall be used in place of "annual asset guidelines repair allowance percentage," to determine whether a capital expenditure as defined by § 60.2(bb) has been made to an existing facility.

(b) The following physical changes or changes in the method of operation shall not by themselves be considered a modification of any existing facility:

(1) The addition of gravity loadout spouts to existing grain storage or grain transfer bins.

(2) The installation of automatic grain weighing scales.

(3) Replacement of motor and drive units driving existing grain handling equipment.

(4) The installation of permanent storage capacity with no increase in hourly grain handling capacity.

Subparts EE–FF—[Reserved]

Subpart GG—Standards of Performance for Stationary Gas Turbines

SOURCE: 44 FR 52798, Sept. 10, 1979, unless otherwise noted.

§ 60.330 Applicability and designation of affected facility.

The provisions of this subpart are applicable to the following affected facilities: all stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour, based on the lower heating value of the fuel fired.

§ 60.331 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Stationary gas turbine" means any simple cycle gas turbine, regenerative cycle gas turbine or any gas turbine portion of a combined cycle steam/electric generating system that is not self propelled. It may, however, be mounted on a vehicle for portability.

(b) "Simple cycle gas turbine" means any stationary gas turbine which does not recover heat from the gas turbine exhaust gases to preheat the inlet combustion air to the gas turbine, or which does not recover heat from the gas turbine exhaust gases to heat water or generate steam.

(c) "Regenerative cycle gas turbine" means any stationary gas turbine which recovers heat from the gas turbine exhaust gases to preheat the inlet combustion air to the gas turbine.

(d) "Combined cycle gas turbine" means any stationary gas turbine which recovers heat from the gas turbine exhaust gases to heat water or generate steam.

(e) "Emergency gas turbine" means any stationary gas turbine which operates as a mechanical or electrical power source only when the primary power source for a facility has been rendered inoperable by an emergency situation.

(f) "Ice fog" means an atmospheric suspension of highly reflective ice crystals.

(g) "ISO standard day conditions" means 288 degrees Kelvin, 60 percent relative humidity and 101.3 kilopascals pressure.

(h) "Efficiency" means the gas turbine manufacturer's rated heat rate at peak load in terms of heat input per unit of power output based on the lower heating value of the fuel.

(i) "Peak load" means 100 percent of the manufacturer's design capacity of the gas turbine at ISO standard day conditions.

(j) "Base load" means the load level at which a gas turbine is normally operated.

(k) "Fire-fighting turbine" means any stationary gas turbine that is used solely to pump water for extinguishing fires.

(l) "Turbines employed in oil/gas production or oil/gas transportation" means any stationary gas turbine used to provide power to extract crude oil/natural gas from the earth or to move crude oil/natural gas, or products refined from these substances through pipelines.

(m) A "Metropolitan Statistical Area" or "MSA" as defined by the Department of Commerce.

(n) "Offshore platform gas turbines" means any stationary gas turbine located on a platform in an ocean.

(o) "Garrison facility" means any permanent military installation.

(p) "Gas turbine model" means a group of gas turbines having the same nominal air flow, combuster inlet pressure, combuster inlet temperature, firing temperature, turbine inlet temperature and turbine inlet pressure.

(q) "Electric utility stationary gas turbine" means any stationary gas turbine constructed for the purpose of supplying more than one-third of its potential electric output capacity to any utility power distribution system for sale.

(r) "Emergency fuel" is a fuel fired by a gas turbine only during circumstances, such as natural gas supply curtailment or breakdown of delivery system, that make it impossible to fire natural gas in the gas turbine.

(s) "Regenerative cycle gas turbine" means any stationary gas turbine that recovers thermal energy from the exhaust gases and utilizes the thermal energy to preheat air prior to entering the combustor.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 1857c-9))

[44 FR 52798, Sept. 10, 1979, as amended at 47 FR 3770, Jan. 27, 1982]

§ 60.332 Standard for nitrogen oxides.

(a) On and after the date of the performance test required by § 60.8 is completed, every owner or operator subject to the provisions of this subpart as specified in paragraphs (b), (c), and (d) of this section shall comply with one of the following, except as provided in paragraphs (e), (f), (g), (h), (i), (j), (k), and (l) of this section.

(1) No owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any stationary gas turbine, any gases which contain nitrogen oxides in excess of:

$$STD = 0.0075 \frac{(14.4)}{Y} + F$$

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where:

STD = allowable NO_x emissions (percent by volume at 15 percent oxygen and on a dry basis).

Y = manufacturer's rated heat rate at manufacturer's rated load (kilojoules per watt hour) or, actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour.

F = NO_x emission allowance for fuel-bound nitrogen as defined in part (3) of this paragraph.

(2) No owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any stationary gas turbine, any gases which contain nitrogen oxides in excess of:

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$$STD = 0.0150 \left(\frac{14.4}{Y}\right) + F$$

where:

STD = allowable NO_x emissions (percent by volume at 15 percent oxygen and on a dry basis).

Y = manufacturer's rated heat rate at manufacturer's rated peak load (kilojoules per watt hour), or actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour.

F = NO_x emission allowance for fuel-bound nitrogen as defined in part (3) of this paragraph.

(3) F shall be defined according to the nitrogen content of the fuel as follows:

Fuel-Bound Nitrogen (percent by weight)	F (NO_x percent by volume)
N ≤ 0.015	0
0.015 < N < 0.1	0.04(N)
0.1 ≤ N ≤ 0.25	0.004 + 0.0067(N-0.1)
N > 0.25	0.005

where:

N = the nitrogen content of the fuel (percent by weight).

or:

Manufacturers may develop custom fuel-bound nitrogen allowances for each gas turbine model they manufacture. These fuel-bound nitrogen allowances shall be substantiated with data and must be approved for use by the Administrator before the initial performance test required by § 60.8. Notices of approval of custom fuel-bound nitrogen allowances will be published in the FEDERAL REGISTER.

(b) Electric utility stationary gas turbines with a heat input at peak load greater than 107.2 gigajoules per hour (100 million Btu/hour) based on the lower heating value of the fuel fired shall comply with the provisions of § 60.332(a)(1).

(c) Stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 million Btu/hour) but less than or equal to 107.2 gigajoules per hour (100 million Btu/hour) based on the lower heating value of the fuel fired, shall comply with the provisions of § 60.332(a)(2).

(d) Stationary gas turbines with a manufacturer's rated base load at ISO conditions of 30 megawatts or less except as provided in § 60.332(b) shall comply with § 60.332(a)(2).

(e) Stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 million Btu/hour) but less than or equal to 107.2 gigajoules per hour (100 million Btu/hour) based on the lower heating value of the fuel fired and that have commenced construction prior to October 3, 1982 are exempt from paragraph (a) of this section.

(f) Stationary gas turbines using water or steam injection for control of NO_x emissions are exempt from paragraph (a) when ice fog is deemed a traffic hazard by the owner or operator of the gas turbine.

(g) Emergency gas turbines, military gas turbines for use in other than a garrison facility, military gas turbines installed for use as military training facilities, and fire fighting gas turbines are exempt from paragraph (a) of this section.

(h) Stationary gas turbines engaged by manufacturers in research and development of equipment for both gas turbine emission control techniques and gas turbine efficiency improvements are exempt from paragraph (a) on a case-by-case basis as determined by the Administrator.

(i) Exemptions from the requirements of paragraph (a) of this section will be granted on a case-by-case basis as determined by the Administrator in specific geographical areas where mandatory water restrictions are required by governmental agencies because of drought conditions. These exemptions will be allowed only while the mandatory water restrictions are in effect.

(j) Stationary gas turbines with a heat input at peak load greater than 107.2 gigajoules per hour that commenced construction, modification, or reconstruction between the dates of October 3, 1977, and January 27, 1982,

and were required in the September 10, 1979, FEDERAL REGISTER (44 FR 52792) to comply with § 60.332(a)(1), except electric utility stationary gas turbines, are exempt from paragraph (a) of this section.

(k) Stationary gas turbines with a heat input greater than or equal to 10.7 gigajoules per hour (10 million Btu/hour) when fired with natural gas are exempt from paragraph (a)(2) of this section when being fired with an emergency fuel.

(l) Regenerative cycle gas turbines with a heat input less than or equal to 107.2 gigajoules per hour (100 million Btu/hour) are exempt from paragraph (a) of this section.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 1857c-9))

[44 FR 52798, Sept. 10, 1979, as amended at 47 FR 3770, Jan. 27, 1982]

§ 60.333 Standard for sulfur dioxide.

On and after the date on which the performance test required to be conducted by § 60.8 is completed, every owner or operator subject to the provision of this subpart shall comply with one or the other of the following conditions:

(a) No owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any stationary gas turbine any gases which contain sulfur dioxide in excess of 0.015 percent by volume at 15 percent oxygen and on a dry basis.

(b) No owner or operator subject to the provisions of this subpart shall burn in any stationary gas turbine any fuel which contains sulfur in excess of 0.8 percent by weight.

§ 60.334 Monitoring of operations.

(a) The owner or operator of any stationary gas turbine subject to the provisions of this subpart and using water injection to control NO_x emissions shall install and operate a continuous monitoring system to monitor and record the fuel consumption and the ratio of water to fuel being fired in the turbine. This system shall be accurate to within ±5.0 percent and shall be approved by the Administrator.

(b) The owner or operator of any stationary gas turbine subject to the provisions of this subpart shall monitor sulfur content and nitrogen content of the fuel being fired in the turbine. The frequency of determination of these values shall be as follows:

(1) If the turbine is supplied its fuel from a bulk storage tank, the values shall be determined on each occasion that fuel is transferred to the storage tank from any other source.

(2) If the turbine is supplied its fuel without intermediate bulk storage the values shall be determined and recorded daily. Owners, operators or fuel vendors may develop custom schedules for determination of the values based on the design and operation of the affected facility and the characteristics of the fuel supply. These custom schedules shall be substantiated with data and must be approved by the Administrator before they can be used to comply with paragraph (b) of this section.

(c) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as follows:

(1) *Nitrogen oxides.* Any one-hour period during which the average water-to-fuel ratio, as measured by the continuous monitoring system, falls below the water-to-fuel ratio determined to demonstrate compliance with § 60.332 by the performance test required in § 60.8 or any period during which the fuel-bound nitrogen of the fuel is greater than the maximum nitrogen content allowed by the fuel-bound nitrogen allowance used during the performance test required in § 60.8. Each report shall include the average water-to-fuel ratio, average fuel consumption, ambient conditions, gas turbine load, and nitrogen content of the fuel during the period of excess emissions, and the graphs or figures developed under § 60.335(a).

(2) *Sulfur dioxide.* Any daily period during which the sulfur content of the fuel being fired in the gas turbine exceeds 0.8 percent.

(3) *Ice fog.* Each period during which an exemption provided in § 60.332(g) is in effect shall be reported in writing to the Administrator quarterly. For each period the ambient conditions existing during the period, the date and time the air pollution control system was deactivated, and the date and time the

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air pollution control system was reactivated shall be reported. All quarterly reports shall be postmarked by the 30th day following the end of each calendar quarter.

(4) *Emergency fuel.* Each period during which an exemption provided in § 60.332(k) is in effect shall be included in the report required in § 60.7(c). For each period, the type, reasons, and duration of the firing of the emergency fuel shall be reported.

(Sec. 114 of the Clean Air Act as amended [42 U.S.C. 1857c-9])

[44 FR 52798, Sept. 10, 1979, as amended at 47 FR 3770, Jan. 27, 1982]

§ 60.335 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.332 as follows:

(1) Reference Method 20 for the concentration of nitrogen oxides and oxygen. For affected facilities under this subpart, the span value shall be 300 parts per million of nitrogen oxides.

(i) The nitrogen oxides emission level measured by Reference Method 20 shall be adjusted to ISO standard day conditions by the following ambient condition correction factor:

$$NO_x = (NO_{x_{obs}}) \left(\frac{P_{ref}}{P_{obs}}\right)^{0.5} e^{19(H_{obs} - 0.00633)} \left(\frac{T_{AMB}}{288°K}\right)^{1.53}$$

where:

NO_x = emissions of NO_x at 15 percent oxygen and ISO standard ambient conditions.

$NO_{x_{obs}}$ = measured NO_x emissions at 15 percent oxygen, ppmv.

P_{ref} = reference combuster inlet absolute pressure at 101.3 kilopascals ambient pressure.

P_{obs} = measured combustor inlet absolute pressure at test ambient pressure.

H_{obs} = specific humidity of ambient air at test.

e = transcendental constant (2.718).

T_{AMB} = temperature of ambient air at test.

The adjusted NO_x emission level shall be used to determine compliance with § 60.332.

(ii) Manufacturers may develop custom ambient condition correction factors for each gas turbine model they manufacture in terms of combustor inlet pressure, ambient air pressure, ambient air humidity and ambient air temperature to adjust the nitrogen oxides emission level measured by the performance test as provided for in § 60.8 to ISO standard day conditions. These ambient condition correction factors shall be substantiated with data and must be approved for use by the Administrator before the initial performance test required by § 60.8. Notices of approval of custom ambient condition correction factors will be published in the FEDERAL REGISTER.

(iii) The water-to-fuel ratio necessary to comply with § 60.332 will be determined during the initial performance test by measuring NO_x emission using Reference Method 20 and the water-to-fuel ratio necessary to comply with § 60.332 at 30, 50, 75, and 100 percent of peak load or at four points in the normal operating range of the gas turbine, including the minimum point in the range and peak load. All loads shall be corrected to ISO conditions using the appropriate equations supplied by the manufacturer.

(2) The analytical methods and procedures employed to determine the nitrogen content of the fuel being fired shall be approved by the Administrator and shall be accurate to within ±5 percent.

(b) The method for determining compliance with § 60.333, except as provided in § 60.8(b), shall be as follows:

(1) Reference Method 20 for the concentration of sulfur dioxide and oxygen or

(2) ASTM D2880-71 for the sulfur content of liquid fuels and ASTM D1072-70 for the sulfur content of gaseous fuels. These methods shall also be used to comply with § 60.334(b).

(c) Analysis for the purpose of determining the sulfur content and the nitrogen content of the fuel as required by § 60.334(b), this subpart, may be performed by the owner/operator, a service contractor retained by the owner/operator, the fuel vendor, or any other qualified agency provided that the analytical methods employed by these agencies comply with the applicable paragraphs of this section.

(Sec. 114 of the Clean Air Act as amended [42 U.S.C. 1857c-91])

Subpart HH—Standards of Performance for Lime Manufacturing Plants

AUTHORITY: Sec. 111 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411, 7601), and additional authority as noted below.

SOURCE: 43 FR 9453, Mar. 7, 1978, unless otherwise noted.

§ 60.340 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities used in the manufacture of lime: rotary lime kilns and lime hydrators.

(b) The provisions of this subpart are not applicable to facilities used in the manufacture of lime at kraft pulp mills.

(c) Any facility under paragraph (a) of this section that commences construction or modification after May 3, 1977, is subject to the requirements of this part.

§ 60.341 Definitions.

As used in this subpart, all terms not defined herein shall have the same meaning given them in the Act and in subpart A of this part.

(a) "Lime manufacturing plant" includes any plant which produces a lime product from limestone by calcination. Hydration of the lime product is also considered to be part of the source.

(b) "Lime product" means the product of the calcination process including, but not limited to, calcitic lime, dolomitic lime, and dead-burned dolomite.

(c) "Rotary lime kiln" means a unit with an inclined rotating drum which is used to produce a lime product from limestone by calcination.

(d) "Lime hydrator" means a unit used to produce hydrated lime product.

§ 60.342 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any rotary lime kiln any gases which:

(i) Contain particulate matter in excess of 0.15 kilogram per megagram of limestone feed (0.30 lb/ton).

(ii) Exhibit 10 percent opacity or greater.

(2) From any lime hydrator any gases which contain particulate matter in excess of 0.075 kilogram per megagram of lime feed (0.15 lb/ton).

§ 60.343 Monitoring of emissions and operations.

(a) The owner or operator subject to the provisions of this subpart shall install, calibrate, maintain, and operate a continuous monitoring system, except as provided in paragraph (b) of this section, to monitor and record the opacity of a representative portion of the gases discharged into the atmosphere from any rotary lime kiln. The span of this system shall be set at 40 percent opacity.

(b) The owner or operator or any rotary lime kiln using a wet scrubbing emission control device subject to the provisions of this subpart shall not be required to monitor the opacity of the gases discharged as required in paragraph (a) of this section, but shall install, calibrate, maintain, and operate the following continuous monitoring devices:

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(1) A monitoring device for the continuous measurement of the pressure loss of the gas stream through the scrubber. The monitoring device must be accurate within ±250 pascals (one inch of water).

(2) A monitoring device for continuous measurement of the scrubbing liquid supply pressure to the control device. The monitoring device must be accurate within ±5 percent of the design scrubbing liquid supply pressure.

(c) The owner or operator of any lime hydrator using a wet scrubbing emission control device subject to the provisions of this subpart shall install, calibrate, maintain, and operate the following continuous monitoring devices:

(1) A monitoring device for the continuous measuring of the scrubbing liquid flow rate. The monitoring device must be accurate within ±5 percent of design scrubbing liquid flow rate.

(2) A monitoring device for the continuous measurement of the electric current, in amperes, used by the scrubber. The monitoring device must be accurate within ±10 percent over its normal operating range.

(d) For the purpose of conducting a performance test under § 60.8, the owner or operator or any lime manufacturing plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device for measuring the mass rate of limestone feed to any affected rotary lime kiln and the mass rate of lime feed to any affected lime hydrator. The measuring device used must be accurate to within ±5 percent of the mass rate over its operating range.

(e) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as all six-minute periods during which the average opacity of the plume from any lime kiln subject to paragraph (a) of this subpart is 10 percent or greater.

(Sec. 114 of the Clean Air Act, as amended (42 U.S.C. 7414))

§ 60.344 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with § 60.322(a) as follows:

(1) Method 5 for the measurement of particulate matter,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate,

(4) Method 3 for gas analysis,

(5) Method 4 for stack gas moisture, and

(6) Method 9 for visible emissions.

(b) For Method 5, the sampling tome for each run shall be at least 60 minutes and the sampling rate shall be at least 0.85 std m^3/h, dry basis (0.53 dscf/min), except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) Because of the high moisture content (40 to 85 percent by volume) of the exhaust gases from hydrators, the Method 5 sample train may be modified to include a calibrated orifice immediately following the sample nozzle when testing lime hydrators. In this configuration, the sampling rate necessary for maintaining isokinetic conditions can be directly related to exhaust gas velocity without a correction for moisture content. Extra care should be exercised when cleaning the sample train with the orifice in this position following the test runs.

(Sec. 114 of the Clean Air Act, as amended (42 U.S.C. 7414))

Subpart KK—Standards of Performance for Lead-Acid Battery Manufacturing Plants

AUTHORITY: Sec. 111, 301(a) of the Clean Air Act as amended (42 U.S.C. 7411, 7601(a)), and additional authority as noted.

SOURCE: 47 FR 16573, Apr. 16, 1982, unless otherwise noted.

§ 60.370 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the affected facilities listed in paragraph (b) of this section at any lead-acid battery manufacturing plant that produces or has the design capacity to produce in one day (24 hours) batteries containing an

amount of lead equal to or greater than 5.9 Mg (6.5 tons).

(b) The provisions of this subpart are applicable to the following affected facilities used in the manufacture of lead-acid storage batteries:

(1) Grid casting facility.

(2) Paste mixing facility.

(3) Three-process operation facility.

(4) Lead oxide manufacturing facility.

(5) Lead reclamation facility.

(6) Other lead-emitting operations.

(c) Any facility under paragraph (b) of this section the construction or modification of which is commenced after January 14, 1980, is subject to the requirements of this subpart.

§ 60.371 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Grid casting facility" means the facility which includes all lead melting pots and machines used for casting the grid used in battery manufacturing.

(b) "Lead-acid battery manufacturing plant" means any plant that produces a storage battery using lead and lead compounds for the plates and sulfuric acid for the electrolyte.

(c) "Lead oxide manufacturing facility" means a facility that produces lead oxide from lead, including product recovery.

(d) "Lead reclamation facility" means the facility that remelts lead scrap and casts it into lead ingots for use in the battery manufacturing process, and which is not a furnace affected under Subpart L of this part.

(e) "Other lead-emitting operation" means any lead-acid battery manufacturing plant operation from which lead emissions are collected and ducted to the atmosphere and which is not part of a grid casting, lead oxide manufacturing, lead reclamation, paste mixing, or three-process operation facility, or a furnace affected under Subpart L of this part.

(f) "Paste mixing facility" means the facility including lead oxide storage, conveying, weighing, metering, and charging operations; paste blending, handling, and cooling operations; and plate pasting, takeoff, cooling, and drying operations.

(g) "Three-process operation facility" means the facility including those processes involved with plate stacking, burning or strap casting, and assembly of elements into the battery case.

§ 60.372 Standards for lead.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any grid casting facility any gases that contain lead in excess of 0.40 milligram of lead per dry standard cubic meter of exhaust (0.000176 gr/dscf).

(2) From any paste mixing facility any gases that contain in excess of 1.00 milligram of lead per dry standard cubic meter of exhaust (0.00044 gr/dscf).

(3) From any three-process operation facility any gases that contain in excess of 1.00 milligram of lead per dry standard cubic meter of exhaust (0.00044 gr/dscf).

(4) From any lead oxide manufacturing facility any gases that contain in excess of 5.0 milligrams of lead per kilogram of lead feed (0.010 lb/ton).

(5) From any lead reclamation facility any gases that contain in excess of 4.50 milligrams of lead per dry standard cubic meter of exhaust (0.00198 gr/dscf).

(6) From any other lead-emitting operation any gases that contain in excess of 1.00 milligram per dry standard cubic meter of exhaust (0.00044 gr/dscf).

(7) From any affected facility other than a lead reclamation facility any gases with greater than 0 percent opacity (measured according to Method 9 and rounded to the nearest whole percentage).

(8) From any lead reclamation facility any gases with greater than 5 percent opacity (measured according to Method 9 and rounded to the nearest whole percentage).

(b) When two or more facilities at the same plant (except the lead oxide manufacturing facility) are ducted to

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a common control device, an equivalent standard for the total exhaust from the commonly controlled facilities shall be determined as follows:

$$S_e = \sum_{a=1}^{N} S_a(Q_{sd_a}/Q_{sd_T})$$

Where:
S_e = is the equivalent standard for the total exhaust stream.
S_a = is the actual standard for each exhaust stream ducted to the control device.
N = is the total number of exhaust streams ducted to the control device.
Q_{sd_a} = is the dry standard volumetric flow rate of the effluent gas stream from each facility ducted to the control device.
Q_{sd_T} = is the total dry standard volumetric flow rate of all effluent gas streams ducted to the control device.

§ 60.373 Monitoring of emissions and operations.

The owner or operator of any lead-acid battery manufacturing facility subject to the provisions of this subpart and controlled by a scrubbing system(s) shall install, calibrate, maintain, and operate a monitoring device(s) that measures and records the pressure drop across the scrubbing system(s) at least once every 15 minutes. The monitoring device shall have an accuracy of ±5 percent over its operating range.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.374 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance according to § 60.8 as follows:

(1) Method 12 for the measurement of lead concentrations,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 4 for stack gas moisture.

(b) For Method 12, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.85 dscm/h (0.53 dscf/min), except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) When different operations in a three-process operation facility are ducted to separate control devices, the lead emission concentration from the facility shall be determined using the equation:

$$C_{Pb_T} = \sum_{a=1}^{N} (C_{Pb_a} Q_{sd_a}/Q_{sd_T})$$

Where:
C_{Pb_T} = is the facility emission concentration for the entire facility.
N = is the number of control devices to which separate operations in the facility are ducted.
C_{Pb_a} = is the emission concentration from each control device.
Q_{sd_a} = is the dry standards volumetric flow rate of the effluent gas stream from each control device.
Q_{sd_T} = is the total dry standard volumetric flow rate from all of the control devices.

(d) For lead oxide manufacturing facilities, the average lead feed rate to a facility, expressed in kilograms per hour, shall be determined for each test run as follows:

(1) Calculate the total amount of lead charged to the facility during the run by multiplying the number of lead pigs (ingots) charged during the run by the average mass of a pig in kilograms or by another suitable method.

(2) Divide the total amount of lead charged to the facility during the run by the duration of the run in hours.

(e) Lead emissions from lead oxide manufacturing facilities, expressed in milligrams per kilogram of lead charged, shall be determined using the following equation:

$$E_{Pb} = C_{Pb} Q_{sd}/F$$

Where:
E_{Pb} = is the lead emission rate from the facility in milligrams per kilogram of lead charged.

C_{Pb} = is the concentration of lead in the exhaust stream in milligrams per dry standard cubic meter as determined according to paragraph (a)(1) of this section.

Q_{sd} = is the dry standard volumetric flow rate in dry standard cubic meters per hour as determined according to paragraph (a)(3) of this section.

F = is the lead feed rate to the facility in kilograms per hour as determined according to paragraph (d) of this section.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

Subpart MM—Standards of Performance for Automobile and Light Duty Truck Surface Coating Operations

SOURCE: 45 FR 85415, Dec. 24, 1980, unless otherwise noted.

§ 60.390 Applicability and designation of affected facility.

(a) The provisions of this subpart apply to the following affected facilities in an automobile or light-duty truck assembly plant: each prime coat operation, each guide coat operation, and each topcoat operation.

(b) Exempted from the provisions of this subpart are operations used to coat plastic body components or all-plastic automobile or light-duty truck bodies on separate coating lines. The attachment of plastic body parts to a metal body before the body is coated does not cause the metal body coating operation to be exempted.

(c) The provisions of this subpart apply to any affected facility identified in paragraph (a) of this section that begins construction, reconstruction, or modification after October 5, 1979.

§ 60.391 Definitions.

(a) All terms used in this subpart that are not defined below have the meaning given to them in the Act and in Subpart A of this part.

"Applied coating solids" means the volume of dried or cured coating solids which is deposited and remains on the surface of the automobile or light-duty truck body.

"Automobile" means a motor vehicle capable of carrying no more than 12 passengers.

"Automobile and light-duty truck body" means the exterior surface of an automobile or light-duty truck including hoods, fenders, cargo boxes, doors, and grill opening panels.

"Bake oven" means a device that uses heat to dry or cure coatings.

"Electrodeposition (EDP)" means a method of applying a prime coat by which the automobile or light-duty truck body is submerged in a tank filled with coating material and an electrical field is used to effect the deposition of the coating material on the body.

"Electrostatic spray application" means a spray application method that uses an electrical potential to increase the transfer efficiency of the coating solids. Electrostatic spray application can be used for prime coat, guide coat, or topcoat operations.

"Flash-off area" means the structure on automobile and light-duty truck assembly lines between the coating application system (dip tank or spray booth) and the bake oven.

"Guide coat operation" means the guide coat spray booth, flash-off area and bake oven(s) which are used to apply and dry or cure a surface coating between the prime coat and topcoat operation on the components of automobile and light-duty truck bodies.

"Light-duty truck" means any motor vehicle rated at 3,850 kilograms gross vehicle weight or less, designed mainly to transport property.

"Plastic body" means an automobile or light-duty truck body constructed of synthetic organic material.

"Plastic body component" means any component of an automobile or light-duty truck exterior surface constructed of synthetic organic material.

"Prime coat operation" means the prime coat spray booth or dip tank, flash-off area, and bake oven(s) which are used to apply and dry or cure the initial coating on components of automobile or light-duty truck bodies.

"Purge" or "line purge" means the coating material expelled from the spray system when clearing it.

"Solvent-borne" means a coating which contains five percent or less water by weight in its volatile fraction.

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"Spray application" means a method of applying coatings by atomizing the coating material and directing the atomized material toward the part to be coated. Spray applications can be used for prime coat, guide coat, and topcoat operations.

"Spray booth" means a structure housing automatic or manual spray application equipment where prime coat, guide coat, or topcoat is applied to components of automobile or light-duty truck bodies.

"Surface coating operation" means any prime coat, guide coat, or topcoat operation on an automobile or light-duty truck surface coating line.

"Topcoat operation" means the topcoat spray booth, flash-off area, and bake oven(s) which are used to apply and dry or cure the final coating(s) on components of automobile and light-duty truck bodies.

"Transfer efficiency" means the ratio of the amount of coating solids transferred onto the surface of a part or product to the total amount of coating solids used.

"VOC content" means all volatile organic compounds that are in a coating expressed as kilograms of VOC per liter of coating solids.

"Waterborne" or "water reducible" means a coating which contains more than five weight percent water in its volatile fraction.

(b) The nomenclature used in this subpart has the following meanings:

C_{aj} = concentration of VOC (as carbon) in the effluent gas flowing through stack (j) leaving the control device (parts per million by volume),

C_{bi} = concentration of VOC (as carbon) in the effluent gas flowing through stack (i) entering the control device (parts per million by volume),

C_{fk} = concentration of VOC (as carbon) in the effluent gas flowing through exhaust stack (k) not entering the control device (parts per million by volume),

D_{ci} = density of each coating (i) as received (kilograms per liter),

D_{dj} = density of each type VOC dilution solvent (j) added to the coatings, as received (kilograms per liter),

D_r = density of VOC recovered from an affected facility (kilograms per liter),

E = VOC destruction efficiency of the control device,

F = fraction of total VOC which is emitted by an affected facility that enters the control device,

G = volume weighted average mass of VOC per volume of applied solids (kilograms per liter),

L_{ci} = volume of each coating (i) consumed, as received (liters),

L_{ci}' = volume of each coating (i) consumed by each application method (l), as received liters),

L_{dj} = volume of each type VOC dilution solvent (j) added to the coatings, as received (liters),

L_r = volume of VOC recovered from an affected facility (liters),

L_s = volume of solids in coatings consumed (liters),

M_d = total mass of VOC in dilution solvent (kilograms),

M_o = total mass of VOC in coatings as received (kilograms),

M_r = total mass of VOC recovered from an affected facility (kilograms),

N = volume weighted average mass of VOC per volume of applied coating solids after the control device

$$\left(\frac{\text{kilograms of VOC}}{\text{liter of applied solids}}\right),$$

Q_{aj} = volumetric flow rate of the effluent gas flowing through stack (j) leaving the control device (dry standard cubic meters per hour),

Q_{bi} = volumetric flow rate of the effluent gas flowing through stack (i) entering the control device (dry standard cubic meters per hour),

Q_{fk} = volumetric flow rate of the effluent gas flowing through exhaust stack (k) not entering the control device (dry standard cubic meters per hour),

T = overall transfer efficiency,

T_l = transfer efficiency for application method (l),

V_{si} = proportion of solids by volume in each coating (i) as received

$$\left(\frac{\text{liter solids}}{\text{liter coating}}\right), \text{ and}$$

W_{oi} = proportion of VOC by weight in each coating (i), as received

$$\left(\frac{\text{kilograms VOC}}{\text{kilograms coating}}\right)$$

§ 60.392 Standards for volatile organic compounds

On and after the date on which the initial performance test required by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any affected facility VOC emissions in excess of:

(a) 0.16 kilograms of VOC per liter of applied coating solids from each prime coat operation.

(b) 1.40 kilograms of VOC per liter of applied coating solids from each guide coat operation.

(c) 1.47 kilograms of VOC per liter of applied coating solids from each topcoat operation.

§ 60.393 Performance test and compliance provisions.

(a) Section 60.8 (d) and (f) do not apply to the performance test procedures required by this section.

(b) The owner or operator of an affected facility shall conduct an initial performance test in accordance with § 60.8(a) and thereafter for each calendar month for each affected facility according to the procedures in this section.

(c) The owner or operator shall use the following procedures for determining the monthly volume weighted average mass of VOC emitted per volume of applied coating solids.

(1) The owner or operator shall use the following procedures for each affected facility which does not use a capture system and a control device to comply with the applicable emission limit specified under § 60.392.

(i) Calculate the volume weighted average mass of VOC per volume of applied coating solids for each calendar month for each affected facility. The owner or operator shall determine the composition of the coatings by formulation data supplied by the manufacturer of the coating or from data determined by an analysis of each coating, as received, by Reference Method 24. The Administrator may require the owner or operator who uses formulation data supplied by the manufacturer of the coating to determine data used in the calculation of the VOC content of coatings by Reference Method 24 or an equivalent or alternative method. The owner or operator shall determine from company records on a monthly basis the volume of coating consumed, as received, and the mass of solvent used for thinning purposes. The volume weighted average of the total mass of VOC per volume of coating solids used each calendar month will be determined by the following procedures.

(A) Calculate the mass of VOC used in each calendar month for each affected facility by the following equation where "n" is the total number of coatings used and "m" is the total number of VOC solvents used:

$$M_o + M_d = \sum_{i=1}^{n} L_{ci} \; D_{ci} \; W_{oi} + \sum_{j=1}^{m} L_{dj} \; D_{dj}$$

[$\Sigma L_{dj} D_{dj}$ will be zero if no VOC solvent is added to the coatings, as received].

(B) Calculate the total volume of coating solids used in each calendar month for each affected facility by the following equation where "n" is the total number of coatings used:

$$L_s = \sum_{i=1}^{n} L_{ci} \; V_{si}$$

(C) Select the appropriate transfer efficiency (T) from the following tables for each surface coating operation:

Application method	Transfer efficiency
Air Atomized Spray (waterborne coating)	0.39
Air Atomized Spray (solvent-borne coating)	0.50
Manual Electrostatic Spray	0.75
Automatic Electrostatic Spray	0.95
Electrodeposition	1.00

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The values in the table above represent an overall system efficiency which includes a total capture of purge. If a spray system uses line purging after each vehicle and does not collect any of the purge material, the following table shall be used:

Application method	Transfer efficiency
Air Atomized Spray (waterborne coating)	0.30
Air Atomized Spray (solvent-borne coating)	0.40
Manual Electrostatic Spray	0.62
Automatic Electrostatic Spray	0.75

If the owner or operator can justify to the Administrator's satisfaction that other values for transfer efficiencies are appropriate, the Administrator will approve their use on a case-by-case basis.

(*l*) When more than one application method (*l*) is used on an individual surface coating operation, the owner or operator shall perform an analysis to determine an average transfer efficiency by the following equation where "n" is the total number of coatings used and "p" is the total number of application methods:

$$T = \frac{\sum_{i=1}^{n} \sum_{\ell=1}^{p} T_{\ell} V_{si} L_{ci\ell}}{L_s}$$

(D) Calculate the volume weighted average mass of VOC per volume of applied coating solids (G) during each calendar month for each affected facility by the following equation:

$$G = \frac{M_o + M_d}{L_s T}$$

(ii) If the volume weighted average mass of VOC per volume of applied coating solids (G), calculated on a calendar month basis, is less than or equal to the applicable emission limit specified in § 60.392, the affected facility is in compliance. Each monthly calculation is a performance test for the purpose of this subpart.

(2) The owner or operator shall use the following procedures for each affected facility which uses a capture system and a control device that destroys VOC (e.g., incinerator) to comply with the applicable emission limit specified under § 60.392.

(i) Calculate the volume weighted average mass of VOC per volume of applied coating solids (G) during each calendar month for each affected facility as described under § 60.393(c)(1)(i).

(ii) Calculate the volume weighted average mass of VOC per volume of applied solids emitted after the control device, by the following equation: $N=G[1-FE]$

(A) Determine the fraction of total VOC which is emitted by an affected facility that enters the control device by using the following equation where "n" is the total number of stacks entering the control device and "p" is the total number of stacks not connected to the control device:

$$F = \frac{\sum_{i=1}^{n} Q_{bi} C_{bi}}{\sum_{l=1}^{n} Q_{bi} C_{bi} + \sum_{k=1}^{p} Q_{fk} C_{fk}}$$

If the owner can justify to the Administrator's satisfaction that another method will give comparable results, the Administrator will approve its use on a case-by-case basis.

(*1*) In subsequent months, the owner or operator shall use the most recently determined capture fraction for the performance test.

(B) Determines the destruction efficiency of the control device using values of the volumetric flow rate of the gas streams and the VOC content (as carbon) of each of the gas streams in and out of the device by the following equation where "n" is the total number of stacks entering the control device and "m" is the total number of stacks leaving the control device:

$$E = \frac{\sum_{i=1}^{n} Q_{bi} C_{bi} - \sum_{j=1}^{m} Q_{aj} C_{aj}}{\sum_{i=1}^{n} Q_{bi} C_{bi}}$$

(*1*) In subsequent months, the owner or operator shall use the most recently determined VOC destruction efficiency for the performance test.

(C) If an emission control device controls the emissions from more than one affected facility, the owner or operator shall measure the VOC concentration (C_{bi}) in the effluent gas entering the control device (in parts per million by volume) and the volumetric flow rate (Q_{bi}) of the effluent gas (in dry standard cubic meters per hour) entering the device through each stack. The destruction or removal efficiency determined using these data shall be applied to each affected facility served by the control device.

(iii) If the volume weighted average mass of VOC per volume of applied solids emitted after the control device (N) calculated on a calendar month basis is less than or equal to the applicable emission limit specified in § 60.392, the affected facility is in compliance. Each monthly calculation is a performance test for the purposes of this subpart.

(3) The owner or operator shall use the following procedures for each affected facility which uses a capture system and a control device that recovers the VOC (e.g., carbon adsorber) to comply with the applicable emission limit specified under § 60.392.

(i) Calculate the mass of VOC (M_o+M_d) used during each calendar month for each affected facility as described under § 60.393(c)(1)(i).

(ii) Calculate the total volume of coating solids (L_s) used in each calendar month for each affected facility as described under § 60.393(c)(1)(i).

(iii) Calculate the mass of VOC recovered (M_r) each calendar month for each affected facility by the following equation: $M_r=L_rD_r$

(iv) Calculate the volume weighted average mass of VOC per volume of applied coating solids emitted after the control device during a calendar month by the following equation:

$$N = \frac{M_o + M_d - M_r}{L_s T}$$

(v) If the volume weighted average mass of VOC per volume of applied solids emitted after the control device (N) calculated on a calendar month basis is less than or equal to the applicable emission limit specified in § 60.392, the affected facility is in compliance. Each monthly calculation is a performance test for the purposes of this subpart.

§ 60.394 Monitoring of emissions and operations.

The owner or operator of an affected facility which uses an incinerator to comply with the emission limits specified under § 60.392 shall install, calibrate, maintain, and operate temperature measurement devices as prescribed below:

(a) Where thermal incineration is used, a temperature measurement device shall be installed in the firebox. Where catalytic incineration is used, a temperature measurement device shall be installed in the gas stream immediately before and after the catalyst bed.

(b) Each temperature measurement device shall be installed, calibrated, and maintained according to accepted practice and the manufacturer's specifications. The device shall have an accuracy of the greater of ±0.75 percent of the temperature being measured expressed in degrees Celsius or ±2.5° C.

(c) Each temperature measurement device shall be equipped with a recording device so that a permanent record is produced.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 74140))

§ 60.395 Reporting and recordkeeping requirements.

(a) Each owner or operator of an affected facility shall include the data outlined in subparagraphs (1) and (2) in the initial compliance report required by § 60.8.

(1) The owner or operator shall report the volume weighted average

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mass of VOC per volume of applied coating solids for each affected facility.

(2) Where compliance is achieved through the use of incineration, the owner or operator shall include the following additional data in the control device initial performance test requried by § 60.8(a) or subsequent performance tests at which destruction efficiency is determined: the combustion temperature (or the gas temperature upstream and downstream of the catalyst bed), the total mass of VOC per volume of applied coating solids before and after the incinerator, capture efficiency, the destruction efficiency of the incinerator used to attain compliance with the applicable emission limit specified in § 60.392 and a description of the method used to establish the fraction of VOC captured and sent to the control device.

(b) Following the initial report, each owner or operator shall report the volume weighted average mass of VOC per volume of applied coating solids for each affected facility during each calendar month in which the affected facility is not in compliance with the applicable emission limit specified in § 60.392. This report shall be postmarked not later than ten days after the end of the calendar month that the affected facility is not in compliance. Where compliance is achieved through the use of a capture system and control device, the volume weighted average after the control device should be reported.

(c) Where compliance with § 60.392 is achieved through the use of incineration, the owner or operator shall continuously record the incinerator combustion temperature during coating operations for thermal incineration or the gas temperature upstream and downstream of the incinerator catalyst bed during coating operations for catalytic incineration. The owner or operator shall report quarterly as defined below.

(1) For thermal incinerators, every three-hour period shall be reported during which the average temperature measured is more than 28°C less than the average temperature during the most recent control device performance test at which the destruction efficiency was determined as specified under § 60.393.

(2) For catalytic incinerators, every three-hour period shall be reported during which the average temperature immediately before the catalyst bed, when the coating system is operational, is more than 28° C less than the average temperature immediately before the catalyst bed during the most recent control device performance test at which destruction efficiency was determined as specified under § 60.393. In addition, every three-hour period shall be reported each quarter during which the average temperature difference across the catalyst bed when the coating system is operational is less than 80 percent of the average temperature difference of the device during the most recent control device performance test at which destruction efficiency was determined as specified under § 60.393.

(3) For thermal and catalytic incinerators, if no such periods occur, the owner or operator shall submit a negative report.

(d) The owner or operator shall notify the Administrator 30 days in advance of any test by Reference Method 25.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.396 Reference methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided in § 60.8 shall be used to conduct performance tests.

(1) Reference Method 24 or an equivalent or alternative method approved by the Administrator shall be used for the determination of the data used in the calculation of the VOC content of the coatings used for each affected facility. Manufacturers' formulation data is approved by the Administrator as an alternative method to Method 24. In the event of dispute, Reference Method 24 shall be the referee method.

(2) Reference Method 25 or an equivalent or alternative method approved by the Administrator shall be used for the determination of the VOC concentration in the effluent gas

entering and leaving the emission control device for each stack equipped with an emission control device and in the effluent gas leaving each stack not equipped with a control device.

(3) The following methods shall be used to determine the volumetric flow rate in the effluent gas in a stack:

(i) Method 1 for sample and velocity traverses,

(ii) Method 2 for velocity and volumetric flow rate,

(iii) Method 3 for gas analysis, and

(iv) Method 4 for stack gas moisture.

(b) For Reference Method 24, the coating sample must be a 1-liter sample taken in a 1-liter container.

(c) For Reference Method 25, the sampling time for each of three runs must be at least one hour. The minimum sample volume must be 0.003 dscm except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator. The Administrator will approve the sampling of representative stacks on a case-by-case basis if the owner or operator can demonstrate to the satisfaction of the Administrator that the testing of representative stacks would yield results comparable to those that would be obtained by testing all stacks.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.397 Modifications.

The following physical or operational changes are not, by themselves, considered modifications of existing facilities:

(a) Changes as a result of model year changeovers or switches to larger cars.

(b) Changes in the application of the coatijgs to increase coating film thickness.

Subpart NN—Standards of Performance for Phosphate Rock Plants

AUTHORITY: Secs. 111 and 301(a) of the Clean Air Act, as amended, (42 U.S.C. 7411, 7601(a)), and additional authority as noted.

SOURCE: 47 FR 16589, Apr. 16, 1982, unless otherwise noted.

§ 60.400 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities used in phosphate rock plants which have a maximum plant production capacity greater than 3.6 megagrams per hour (4 tons/hr): dryers, calciners, grinders, and ground rock handling and storage facilities, except those facilities producing or preparing phosphate rock solely for consumption in elemental phosphorus production.

(b) Any facility under paragraph (a) of this section which commences construction, modification, or reconstruction after September 21, 1979, is subject to the requirements of this part.

§ 60.401 Definitions.

(a) "Phosphate rock plant" means any plant which produces or prepares phosphate rock product by any or all of the following processes: Mining, beneficiation, crushing, screening, cleaning, drying, calcining, and grinding.

(b) "Phosphate rock feed" means all material entering the process unit including, moisture and extraneous material as well as the following ore minerals: Fluorapatite, hydroxylapatite, chlorapatite, and carbonateapatite.

(c) "Dryer" means a unit in which the moisture content of phosphate rock is reduced by contact with a heated gas stream.

(d) "Calciner" means a unit in which the moisture and organic matter of phosphate rock is reduced within a combustion chamber.

(e) "Grinder" means a unit which is used to pulverize dry phosphate rock to the final product size used in the manufacture of phosphate fertilizer and does not include crushing devices used in mining.

(f) "Ground phosphate rock handling and storage system" means a system which is used for the conveyance and storage of ground phosphate rock from grinders at phosphate rock plants.

(g) "Beneficiation" means the process of washing the rock to remove impurities or to separate size fractions.

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§ 60.402 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

(1) From any phosphate rock dryer any gases which:

(i) Contain particulate matter in excess of 0.030 kilogram per megagram of phosphate rock feed (0.06 lb/ton), or

(ii) Exhibit greater than 10-percent opacity.

(2) From any phosphate rock calciner processing unbeneficiated rock or blends of beneficiated and unbeneficiated rock, any gases which:

(i) Contains particulate matter in excess of 0.12 kilogram per megagram of phosphate rock feed (0.23 lb/ton), or

(ii) Exhibit greater than 10-percent opacity.

(3) From any phosphate rock calciner processing beneficiated rock any gases which:

(i) Contain particulate matter in excess of 0.055 kilogram per megagram of phosphate rock feed (0.11 lb/ton), or

(ii) Exhibit greater than 10-percent opacity.

(4) From any phosphate rock grinder any gases which:

(i) Contain particulate matter in excess of 0.006 kilogram per megagram of phosphate rock feed (0.012 lb/ton), or

(ii) Exhibit greater than zero-percent opacity.

(5) From any ground phosphate rock handling and storage system any gases which exhibit greater than zero-percent opacity.

§ 60.403 Monitoring of emissions and operations.

(a) Any owner or operator subject to the provisions of this subpart shall install, calibrate, maintain, and operate a continuous monitoring system, except as provided in paragraphs (b) and (c) of this section, to monitor and record the opacity of the gases discharged into the atmosphere from any phosphate rock dryer, calciner, or grinder. The span of this system shall be set at 40-percent opacity.

(b) For ground phosphate rock storage and handling systems, continuous monitoring systems for measuring opacity are not required.

(c) The owner or operator of any affected phosphate rock facility using a wet scrubbing emission control device shall not be subject to the requirements in paragraph (a) of this section, but shall install, calibrate, maintain, and operate the following continuous monitoring devices:

(1) A monitoring device for the continuous measurement of the pressure loss of the gas stream through the scrubber. The monitoring device must be certified by the manufacturer to be accurate within ±250 pascals (±1 inch water) gauge pressure.

(2) A monitoring device for the continuous measurement of the scrubbing liquid supply pressure to the control device. The monitoring device must be accurate within ±5 percent of design scrubbing liquid supply pressure.

(d) For the purpose of conducting a performance test under § 60.8, the owner or operator of any phosphate rock plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device for measuring the phosphate rock feed to any affected dryer, calciner, or grinder. The measuring device used must be accurate to within ±5 percent of the mass rate over its operating range.

(e) For the purpose of reports required under § 60.7(c), periods of excess emissions that shall be reported are defined as all 6-minute periods during which the average opacity of the plume from any phosphate rock dryer, calciner, or grinder subject to paragraph (a) of this section exceeds the applicable opacity limit.

(f) Any owner or operator subject to the requirements under paragraph (c) of this section shall report for each calendar quarter all measurement results that are less than 90 percent of the average levels maintained during the most recent performance test conducted under § 60.8 in which the affected facility demonstrated compliance with the standard under § 60.402.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

§ 60.404 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with § 60.402 as foklows:

(1) Method 5 for the measurement of particulate matter and associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rates,

(4) Method 3 for gas analysis, and

(5) Method 9 for the measurement of the opacity of emissions.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and have a minimum sampled volume of 0.84 dscm (30 dscf). However, shorter sampling times and smaller sample volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) For each run, the average phosphate rock feed rate in megagrams per hour shall be determined using a device meeting the requirements of § 60.403(d).

(d) For each run, emissions expressed in kilograms per megagram of phosphate rock feed shall be determined using the following equation:

$$\frac{E=(CsQs)10^{-6}}{M}$$

where, E=Emissions of particulates in kg/Mg of phosphate rock feed.

Cs=Concentration of particulates in mg/dscm as measured by Method 5.

Qs=Volumetric flow rate in dscm/hr as determined by Method 2.

10^{-6}=Conversion factor for milligrams to kilograms.

M=Average phosphate rock feed rate in mg/hr.

(Sec. 114, Clean Air Act, as amended, (42 U.S.C. 7414))

Subpart PP—Standards of Performance for Ammonium Sulfate Manufacture

SOURCE: 45 FR 74850, Nov. 12, 1980, unless otherwise noted.

§ 60.420 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each ammonium sulfate dryer within an ammonium sulfate manufacturing plant in the caprolactam by-product, synthetic, and coke oven by-product sectors of the ammonium sulfate industry.

(b) Any facility under paragraph (a) of this section that commences construction or modification after February 4, 1980, is subject to the requirements of this subpart.

§ 60.421 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A.

"Ammonium sulfate dryer" means a unit or vessel into which ammonium sulfate is charged for the purpose of reducing the moisture content of the product using a heated gas stream. The unit includes foundations, superstructure, material charger systems, exhaust systems, and integral control systems and instrumentation.

"Ammonium sulfate feed material streams" means the sulfuric acid feed stream to the reactor/crystallizer for synthetic and coke oven by-product ammonium sulfate manufacturing plants; and means the total or combined feed streams (the oximation ammonium sulfate stream and the rearrangement reaction ammonium sulfate stream) to the crystallizer stage, prior to any recycle streams.

"Ammonium sulfate manufacturing plant" means any plant which produces ammonium sulfate.

"Caprolactam by-product ammonium sulfate manufacturing plant" means any plant which produces ammonium sulfate as a by-product from process streams generated during caprolactam manufacture.

"Coke oven by-product ammonium sulfate manufacturing plant" means any plant which produces ammonium sulfate by reacting sulfuric acid with ammonia recovered as a by-product from the manufacture of coke.

"Synthetic ammonium sulfate manufacturing plant" means any plant

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which produces ammonium sulfate by direct combination of ammonia and sulfuric acid.

§ 60.422 Standards for particulate matter.

On or after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator of an ammonium sulfate dryer subject to the provisions of this subpart shall cause to be discharged into the atmosphere, from any ammonium sulfate dryer, particulate matter at an emission rate exceeding 0.15 kilogram of particulate per megagram of ammonium sulfate produced (0.30 pound of particulate per ton of ammonium sulfate produced) and exhaust gases with greater than 15 percent opacity.

§ 60.423 Monitoring of operations.

(a) The owner or operator of any ammonium sulfate manufacturing plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate flow monitoring devices which can be used to determine the mass flow of ammonium sulfate feed material streams to the process. The flow monitoring device shall have an accuracy of ± 5 percent over its range. However, if the plant uses weigh scales of the same accuracy to directly measure production rate of ammonium sulfate, the use of flow monitoring devices is not required.

(b) The owner or operator of any ammonium sulfate manufacturing plant subject to the provisions of this subpart shall install, calibrate, maintain, and operate a monitoring device which continuously measures and permanently records the total pressure drop across the emission control system. The monitoring device shall have an accuracy of ± 5 percent over its operating range.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.424 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided in § 60.8(b), shall be used to determine compliance with § 60.422 as follows:

(1) Method 5 for the concentration of particulate matter.

(2) Method 1 for sample and velocity traverses.

(3) Method 2 for velocity and volumetric flow rate.

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the volume shall be at least 1.50 dry standard cubic meters (53 dry standard cubic feet).

(c) For each run, the particulate emission rate, E, shall be computed as follows:

$$E = Q_{sd} \times C_s \div 1000$$

(1) E is the particulate emission rate (kg/h),

(2) Q_{sd} is the average volumetric flow rate (dscm/h) as determined by Method 2; and

(3) C_s is the average concentration (g/dscm) of particulate matter as determined by Method 5.

(d) For each run, the rate of ammonium sulfate production, P (Mg/h), shall be determined by direct measurement using product weigh scales or computed from a material balance. If production rate is determined by material balance, the following equations shall be used.

(1) For synthetic and coke oven by-product ammonium sulfate plants, the ammonium sulfate production rate shall be determined using the following equation:

$$P = A \times B \times C \times 0.0808$$

where:

P = Ammonium sulfate production rate in megagrams per hour.

A = Sulfuric acid flow rate to the reactor/crystallizer in liters per minute averaged over the time period taken to conduct the run.

B = Acid density (a function of acid strength and temperature) in grams per cubic centimeter.

C = Percent acid strength in decimal form.

0.0808 = Physical constant for conversion of time, volume, and mass units.

(2) For caprolactam by-product ammonium sulfate plants the ammonium sulfate production rate shall be determined using the following equation:

$$P = D \times E \times F \times (6.0 \times 10^{-5})$$

where:

P=Production rate of caprolactam by-product ammonium sulfate in megagrams per hour.
D=Total combined feed stream flow rate to the ammonium sulfate crystallizer before the point where any recycle streams enter the stream, in liters per minute averaged over the time period taken to conduct the test run.
E=Density of the process stream solution in grams per liter.
F=Percent mass of ammonium sulfate in the process solution in decimal form.
6.0×10^{-5}=Physical constant for conversion of time and mass units.

(e) For each run, the dryer emission rate shall be computed as follows:

$R = E/P$

where:

(1) R is the dryer emission rate (kg/Mg);
(2) E is the particulate emission rate (ky/h) from (c) above; and
(3) P is the rate of ammonium sulfate production (Mg/h) from (d) above.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

Appendix A—Reference Methods

The reference methods in this appendix are referred to in § 60.8 (Performance Tests) and § 60.11 (Compliance With Standards and Maintenance Requirements) of 40 CFR Part 60, Subpart A (General Provisions). Specific uses of these reference methods are described in the standards of performance contained in the subparts, beginning with Subpart D.

Within each standard of performance, a section titled "Test Methods and Procedures" is provided to (1) identify the test methods applicable to the facility subject to the respective standard and (2) identify any special instructions or conditions to be followed when applying a method to the respective facility. Such instructions (for example, establish sampling rates, volumes, or temperatures) are to be used either in addition to, or as a substitute for procedures in a reference method. Similarly, for sources subject to emission monitoring requirements, specific instructions pertaining to any use of a reference method are provided in the subpart or in Appendix B.

Inclusion of methods in this appendix is not intended as an endorsement or denial of their applicability to sources that are not subject to standards of performance. The methods are potentially applicable to other sources; however, applicability should be confirmed by careful and appropriate evaluation of the conditions prevalent at such sources.

The approach followed in the formulation of the reference methods involves specifications for equipment, procedures, and performance. In concept, a performance specification approach would be preferable in all methods because this allows the greatest flexibility to the user. In practice, however, this approach is impractical in most cases because performance specifications cannot be established. Most of the methods described herein, therefore, involve specific equipment specifications and procedures, and only a few methods in this appendix rely on performance criteria.

Minor changes in the reference methods should not necessarily affect the validity of the results and it is recognized that alternative and equivalent methods exist. Section 60.8 provides authority for the Administrator to specify or approve (1) equivalent methods, (2) alternative methods, and (3) minor changes in the methodology of the reference methods. It should be clearly understood that unless otherwise identified all such methods and changes must have prior approval of the Administrator. An owner employing such methods or deviations from the reference methods without obtaining prior approval does so at the risk of subsequent disapproval and retesting with approved methods.

Within the reference methods, certain specific equipment or procedures are recognized as being acceptable or potentially acceptable and are specifically identified in the methods. The items identified as acceptable options may be used without approval but must be identified in the test report. The potentially approvable options are cited as "subject to the approval of the Administrator" or as "or equivalent." Such potentially approvable techniques or alternatives may be used at the discretion of the owner without prior approval. However, detailed descriptions for applying these potentially approvable techniques or alternatives are not provided in the reference methods. Also, the potentially approvable options are not necessarily acceptable in all applications. Therefore, an owner electing to use such potentially approvable techniques or alternatives is responsible for: (1) assuring that the techniques or alternatives are in fact applicable and are properly executed; (2) including a written description of the alternative method in the test report (the written method must be clear and must be capable of being performed without additional instruction, and the the degree of detail should be similar to the detail contained in the reference methods); and (3) providing any rationale or supporting data necessary to show the validity of the alternative in the particular application. Failure to meet these requirements can result in the Administrator's disapproval of the alternative.

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METHOD 1—SAMPLE AND VELOCITY TRAVERSES FOR STATIONARY SOURCES

1. *Principle and Applicability*

1.1 Principle. To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

1.2 Applicability. This method is applicable to flowing gas streams in ducts, stacks, and flues. The method cannot be used when: (1) flow is cyclonic or swirling (see Section 2.4), (2) a stack is smaller than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) cross-sectional area, or (3) the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

The requirements of this method must be considered before construction of a new facility from which emissions will be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator, U.S. Environmental Protection Agency.

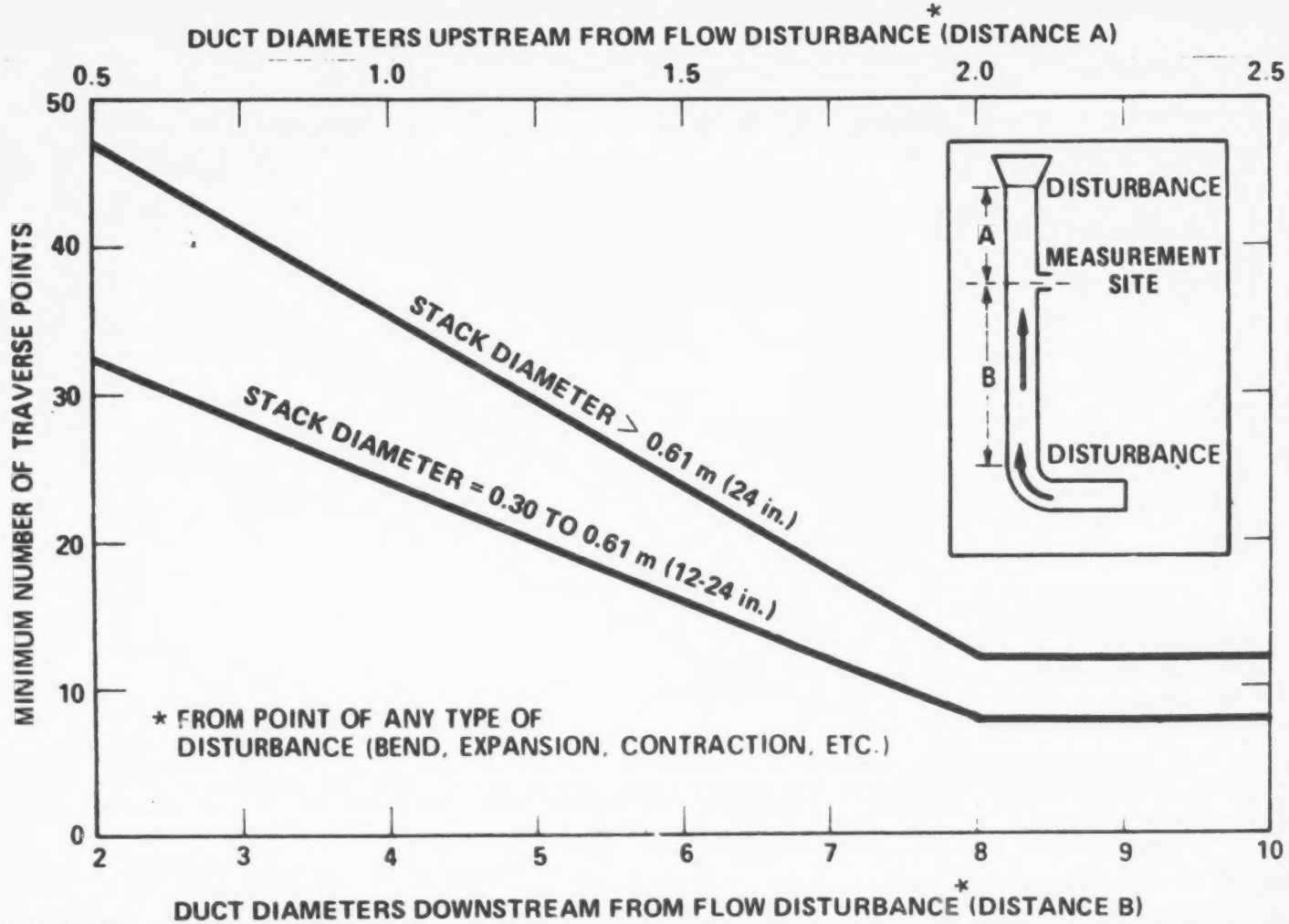
2. *Procedure*

2.1 Selection of Measurement Site. Sampling or velocity measurement is performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance. For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances.

$$D_e = \frac{2LW}{(L+W)}$$

where L=length and W=width.

2.2 Determining the Number of Traverse Points.



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2.2.1 Particulate Traverses. When the eight- and two-diameter criterion can be met, the minimum number of traverse points shall be: (1) twelve, for circular or rectangular stacks with diameters (or equivalent diameters) greater than 0.61 meter (24 in.); (2) eight, for circular stacks with diameters between 0.30 and 0.61 meter (12–24 in.); (3) nine, for rectangular stacks with equivalent diameters between 0.30 and 0.61 meter (12–24 in.).

When the eight- and two-diameter criterion cannot be met, the minimum number of traverse points is determined from Figure 1–1. Before referring to the figure, however, determine the distances from the chosen measurement site to the nearest upstream and downstream disturbances, and divide each distance by the stack diameter or equivalent diameter, to determine the distance in terms of the number of duct diameters. Then, determine from Figure 1–1 the minimum number of traverse points that corresponds: (1) to the number of duct diameters upstream; and (2) to the number of diameters downstream. Select the higher of the two minimum numbers of traverse points, or a greater value, so that for circular stacks the number is a multiple of 4, and for rectangular stacks, the number is one of those shown in Table 1–1.

TABLE 1–1. CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of traverse points	Matrix layout
9	3x3
12	4x3
16	4x4
20	5x4
25	5x5
30	6x5
36	6x6
42	7x6
49	7x7

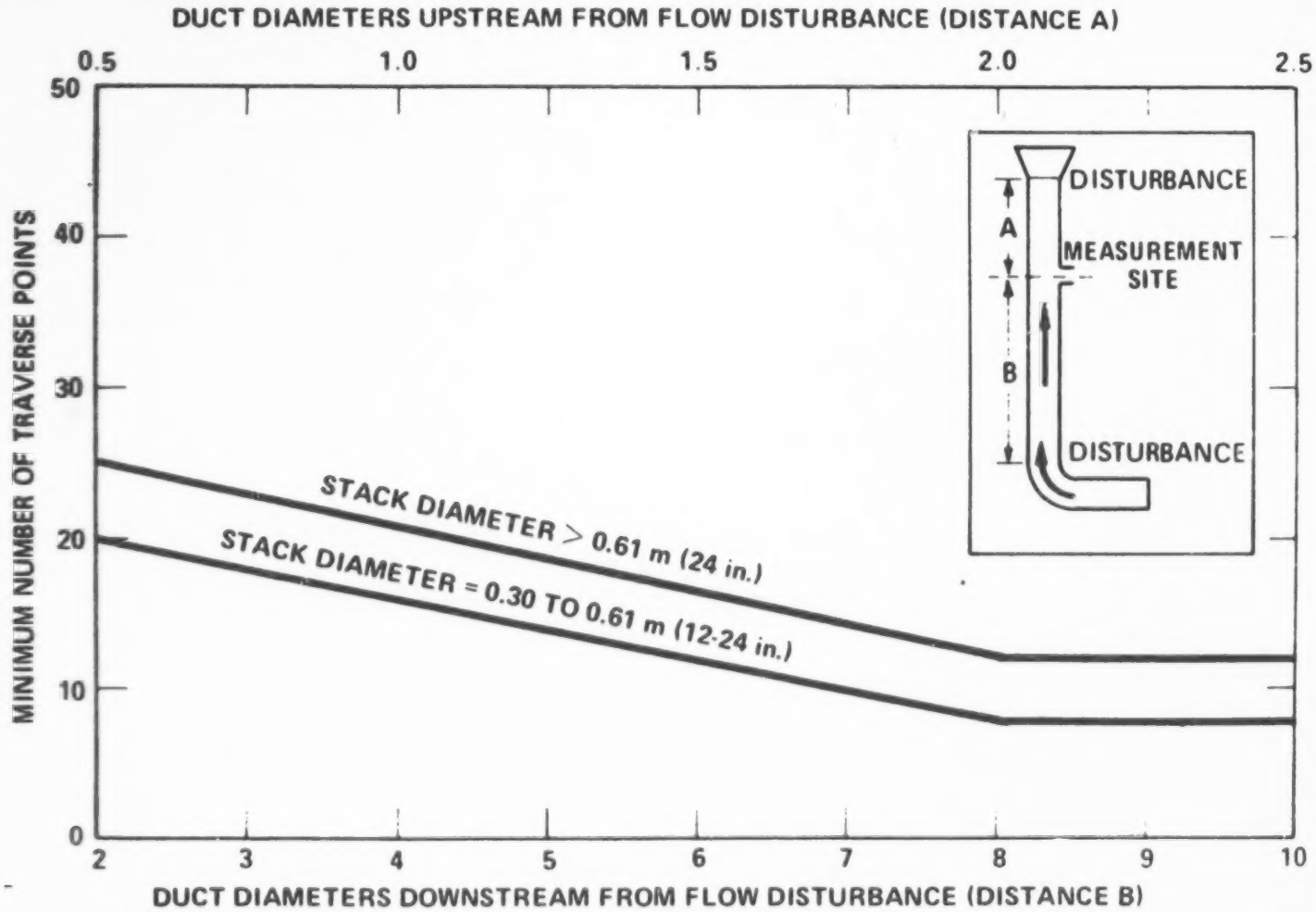

Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

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2.2.2 Velocity (Non-Particulate) Traverses. When velocity or volumetric flow rate is to be determined (but not particulate matter), the same procedure as that for particulate traverses (Section 2.2.1) is followed, except that Figure 1-2 may be used instead of Figure 1-1.

2.3 Cross-sectional Layout and Location of Traverse Points.

2.3.1 Circular Stacks. Locate the traverse points on two perpendicular diameters according to Table 1-2 and the example shown in Figure 1-3. Any equation (for examples, see Citations 2 and 3 in the Bibliography) that gives the same values as those in Table 1-2 may be used in lieu of Table 1-2.

For particulate traverses, one of the diameters must be in a plane containing the greatest expected concentration variation, e.g., after bends, one diameter shall be in the plane of the bend. This requirement becomes less critical as the distance from the disturbance increases; therefore, other diameter locations may be used, subject to approval of the Administrator.

In addition for stacks having diameters greater than 0.61 m (24 in.) no traverse points shall be located within 2.5 centimeters (1.00 in.) of the stack walls; and for stack diameters equal to or less than 0.61 m (24 in.), no traverse points shall be located within 1.3 cm (0.50 in.) of the stack walls. To meet these criteria, observe the procedures given below.

2.3.1.1 Stacks With Diameters Greater Than 0.61 m (24 in.). When any of the traverse points as located in Section 2.3.1 fall within 2.5 cm (1.00 in.) of the stack walls, relocate them away from the stack walls to: (1) a distance of 2.5 cm (1.00 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger. These relocated traverse points (on each end of a diameter) shall be the "adjusted" traverse points.

Whenever two successive traverse points are combined to form a single adjusted traverse point, treat the adjusted point as two separate traverse points, both in the sampling (or velocity measurement) procedure, and in recording the data.

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

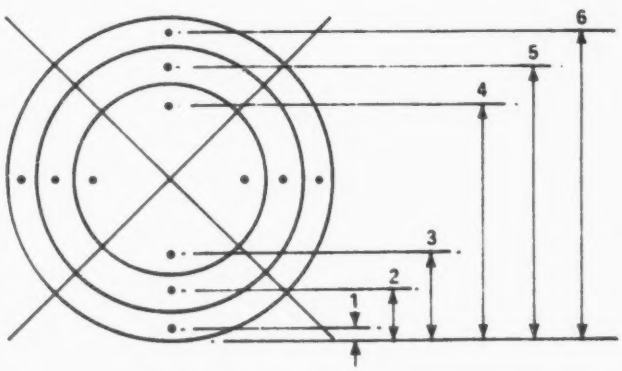

Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

[Percent of stack diameter from inside wall to traverse point]

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS—Continued

[Percent of stack diameter from inside wall to traverse point]

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

2.3.1.2 Stacks With Diameters Equal to or Less Than 0.61 m (24 in.). Follow the procedure in Section 2.3.1.1, noting only that any "adjusted" points should be relocated away from the stack walls to: (1) a distance of 1.3 cm (0.50 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger.

2.3.2 Rectangular Stacks. Determine the number of traverse points as explained in Sections 2.1 and 2.2 of this method. From Table 1-1, determine the grid configuration. Divide the stack cross-section into as many equal rectangular elemental areas as traverse points, and then locate a traverse point at the centroid of each equal area according to the example in Figure 1-4.

If the tester desires to use more than the minimum number of traverse points, expand the "minimum number of traverse points" matrix (see Table 1-1) by adding the extra traverse points along one or the other or both legs of the matrix; the final matrix need not be balanced. For example, if a 4x3 "minimum number of points; matrix were expanded to 36 points, the final matrix could be 9x4 or 12x3, and would not necessarily have to be 6x6. After constructing the final matrix, divide the stack cross-section into as many equal rectangular, elemental areas as traverse points, and locate a traverse point at the centroid of each equal area.

The situation of traverse points being too close to the stack walls is not expected to arise with rectangular stacks. If this problem should ever arise, the Administrator must be contacted for resolution of the matter.

2.4 Verification of Absence of Cyclonic Flow. In most stationary sources, the direction of stack gas flow is essentially parallel to the stack walls. However, cyclonic flow may exist (1) after such devices as cyclones and inertial demisters following venturi scrubbers, or (2) in stacks having tangential inlets or other duct configurations which tend to induce swirling; in these instances, the presence or absence of cyclonic flow at the sampling location must be determined. The following techniques are acceptable for this determination.

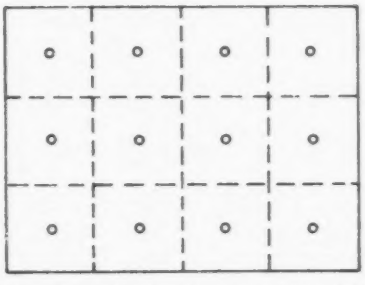

Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

Level and zero the manometer. Connect a Type S pitot tube to the manometer. Position the Type S pitot tube at each traverse point, in succession, so that the planes of the face openings of the pitot tube are perpendicular to the stack cross-sectional plane; when the Type S pitot tube is in this position, it is at "0° reference." Note the differential pressure (Δp) reading at each traverse point. If a null (zero) pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point. If the pitot reading is not zero at 0° reference, rotate the pitot tube (up to $\pm 90°$ yaw angle), until a null reading is obtained. Carefully determine and record the value of the rotation angle (α) to the near-

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est degree. After the null technique has been applied at each traverse point, calculate the average of the absolute values of α; assign α values of 0° to those points for which no rotation was required, and include these in the overall average. If the average value of α is greater than 10°, the overall flow condition in the stack is unacceptable and alternative methodology, subject to the approval of the Administrator, must be used to perform accurate sample and velocity traverses.

3. *Bibliography*

1. Determining Dust Concentration in a Gas Stream, ASME. Performance Test Code No. 27. New York, 1957.

2. Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District. Los Angeles, CA. November 1963.

3. Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co. Los Angeles, CA. Bulletin WP-50. 1968.

4. Standard Method for Sampling Stacks for Particulate Matter. In: 1971 Book of ASTM Standards, Part 23. ASTM Designation D-2928-71. Philadelphia, Pa. 1971.

5. Hanson, H. A., et al. Particulate Sampling Strategies for Large Power Plants Including Nonuniform Flow. USEPA, ORD, ESRL, Research Triangle Park, N.C. EPA-600/2-76-170, June 1976.

6. Entropy Environmentalists, Inc. Determination of the Optimum Number of Sampling Points: An Analysis of Method 1 Criteria. Environmental Protection Agency, Research Triangle Park, N.C. EPA Contract No. 68-01-3172, Task 7.

Method 2—Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

1. *Principle and Applicability*

1.1 Principle. The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

1.2 Applicability. This method is applicable for measurement of the average velocity of a gas stream and for quantifying gas flow.

This procedure is not applicable at measurement sites which fail to meet the criteria of Method 1, Section 2.1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams; Section 2.4 of Method 1 shows how to determine cyclonic or swirling flow conditions. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, U.S. Environmental Protection Agency, must be employed to make accurate flow rate determinations; examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

2. *Apparatus*

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

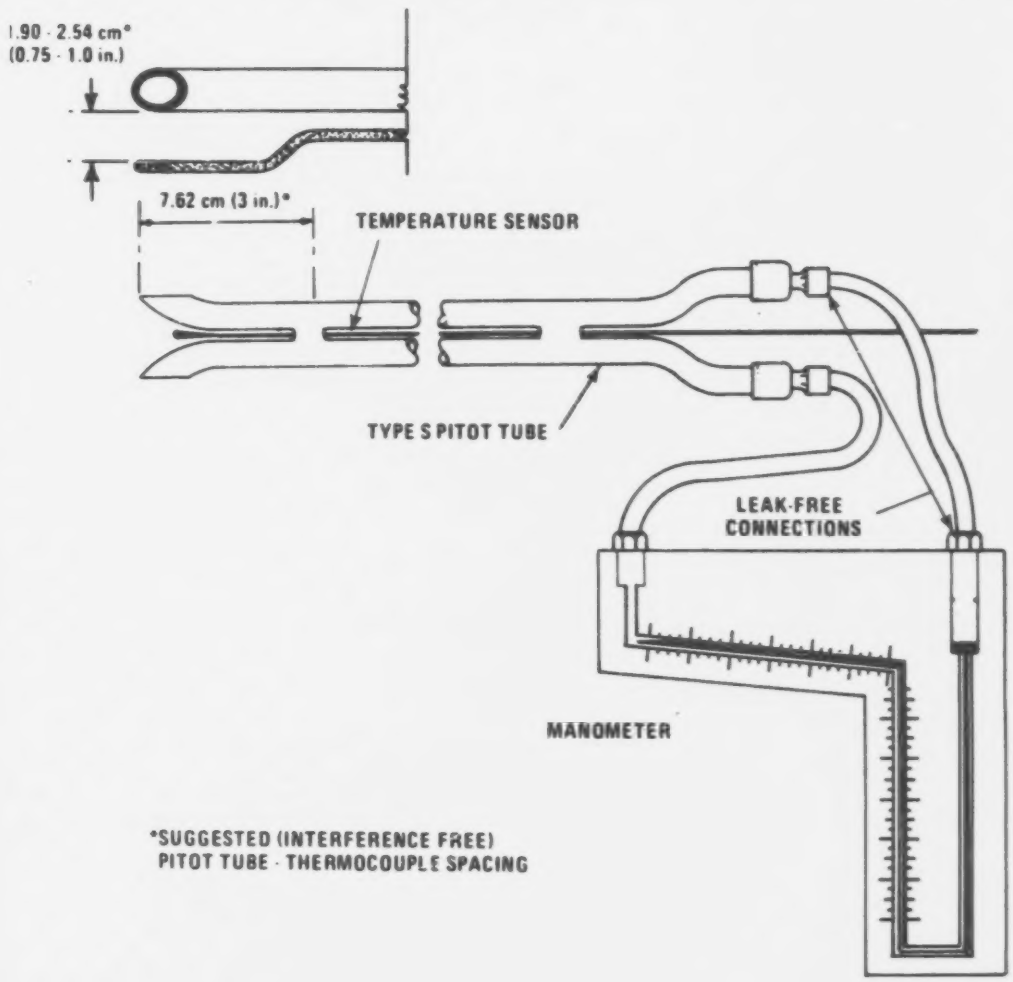

Figure 2-1. Type S pitot tube manometer assembly.

2.1 Type S Pitot Tube. The Type S pitot tube (Figure 2-1) shall be made of metal tubing (e.g. stainless steel). It is recommended that the external tubing diameter (dimension D_t Figure 2-2b) be between 0.48 and 0.95 centimeters (3/16 and 3/8 inch). There shall be an equal distance from the base of each leg of the pitot tube to its face-opening plane (dimensions P_A and P_B Figure 2-2b); it is recommended that this distance be between 1.05 and 1.50 times the external tubing diameter. The face openings of the pitot tube shall, preferably, be aligned as shown in Figure 2-2; however, slight misalignments of the openings are permissible (see Figure 2-3).

The Type S pitot tube shall have a known coefficient, determined as outlined in Section 4. an identification number shall be assigned to the pitot tube; this number shall be permanently marked or engraved on the body of the tube.

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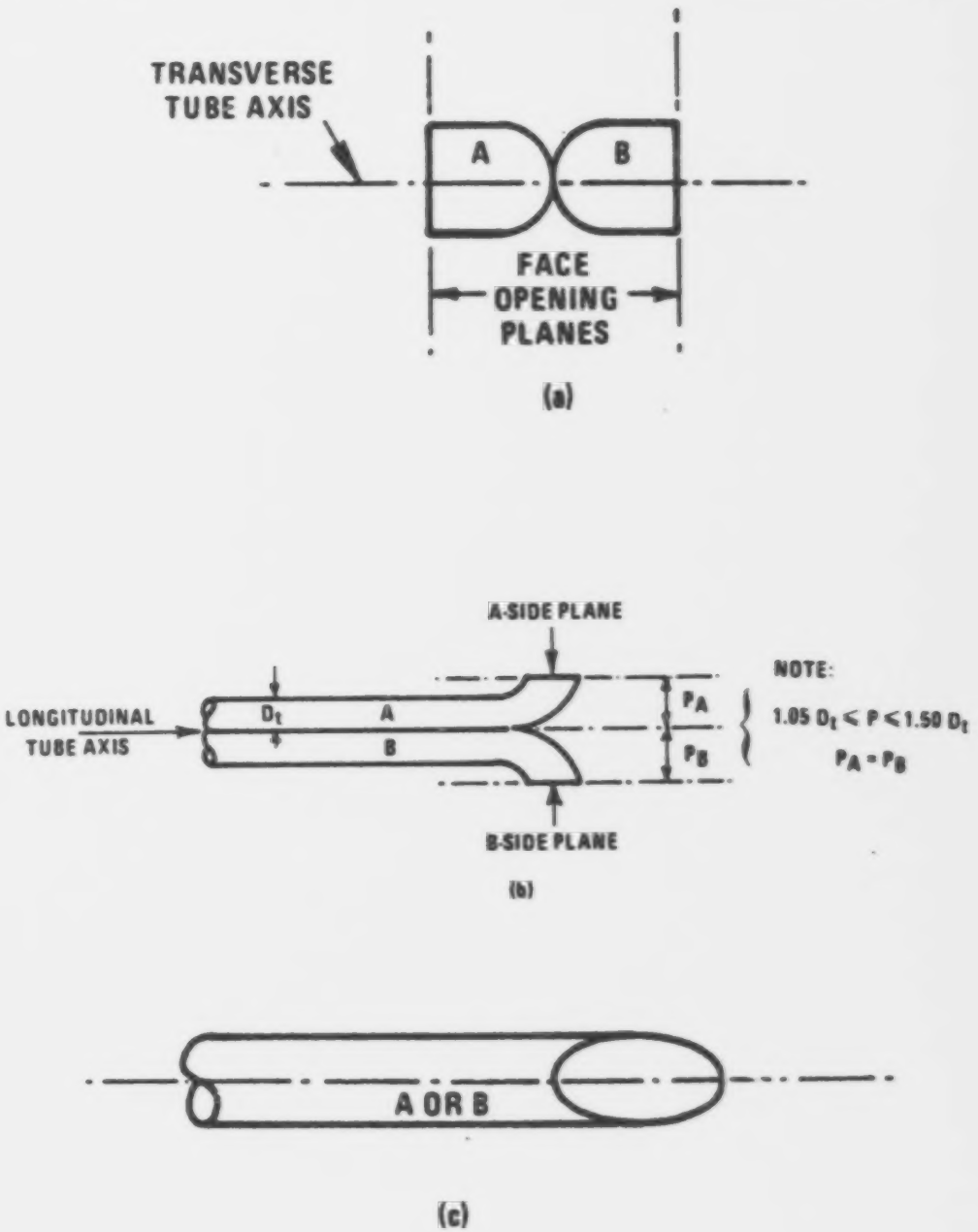
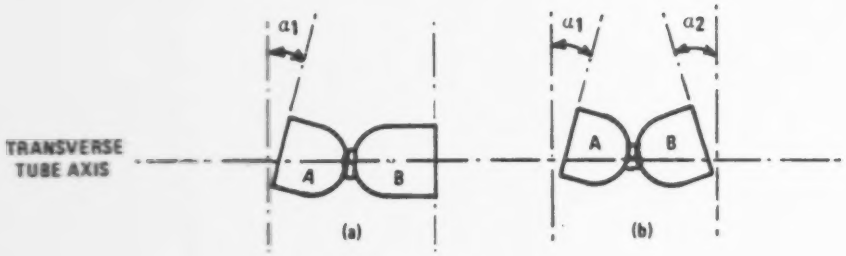
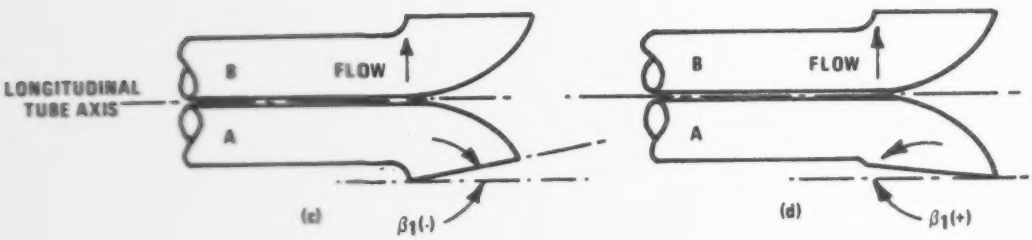
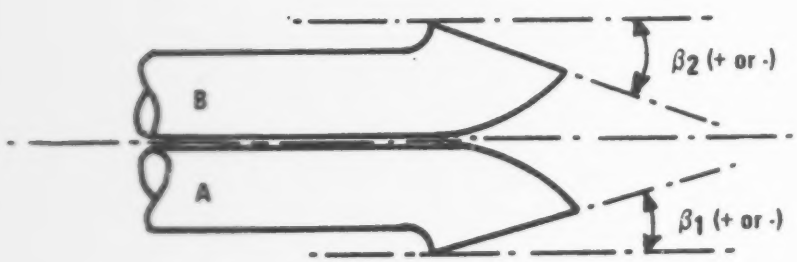


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.







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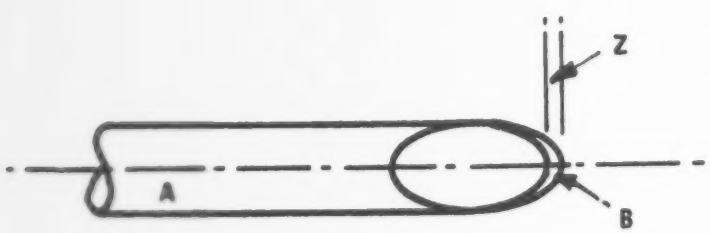

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Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) so long as $\alpha 1$ and $\alpha 2$ 10°, $\beta 1$ and $\beta 2$ 5°, z 0.32 cm (1/8 in.) and w 0.08 cm (1/32 in.) (citation 11 in Section 6).

A standard pitot tube may be used instead of a Type S, provided that it meets the specifications of Sections 2.7 and 4.2; note, however, that the static and impact pressure holes of standard pitot tubes are susceptible to plugging in particulate-laden gas streams. Therefore, whenever a standard pitot tube is used to perform a traverse, adequate proof must be furnished that the openings of the pitot tube have not plugged up during the traverse period; this can be done by taking a velocity head (Δp) reading at the final traverse point, cleaning out the impact and static holes of the standard pitot tube by "back-purging" with pressurized air, and then taking another Δp reading. If the Δp readings made before and after the air purge are the same (±5 percent), the traverse is acceptable. Otherwise, reject the run. Note that if Δp at the final traverse point is unsuitably low, another point may be selected. If "back-purging" at regular intervals is part of the procedure, then comparative Δp readings shall be taken, as above, for the last two back purges at which suitably high Δp readings are observed.

2.2 Differential Pressure Gauge. An inclined manometer or equivalent device is used. Most sampling trains are equipped with a 10-in. (water column) inclined-vertical manometer, having 0.01-in. H_2O divisions on the 0-to 1-in. inclined scale, and 0.1-in. H_2O divisions on the 1- to 10-in. vertical scale. This type of manometer (or other gauge of equivalent sensitivity) is satisfactory for the measurement of Δp values as low as 1.3 mm (0.05 in.) H_2O. However, a differential pressure gauge of greater sensitivity shall be used (subject to the approval of the Administrator), if any of the following is found to be true: (1) the arithmetic average of all Δp readings at the traverse points in the stack is less than 1.3 mm (0.05 in.) H_2O; (2) for traverses of 12 or more points, more than 10 percent of the individual Δp readings are below 1.3 mm (0.05 in.) H_2O; (3) for traverses of fewer than 12 points, more than one Δp reading is below 1.3 mm (0.05 in.) H_2O. Citation 18 in Section 6 describes commercially available instrumentation for the measurement of low-range gas velocities.

As an alternative to criteria (1) through (3) above, the following calculation may be performed to determine the necessity of using a more sensitive differential pressure gauge:

$$T = \frac{\sum_{i=1}^{n} \sqrt{\Delta p_i} + K}{\sum_{i=1}^{n} \sqrt{\Delta p_i}}$$

where:

Δp_i = Individual velocity head reading at a traverse point, mm H_2O (in. H_2O).

n = Total number of traverse points.

K = 0.13 mm H_2O when metric units are used and 0.005 in H_2O when English units are used.

If T is greater than 1.05, the velocity head data are unacceptable and a more sensitive differential pressure gauge must be used.

NOTE: If differential pressure gauges other than inclined manometers are used (e.g., magnehelic gauges), their calibration must be checked after each test series. To check the calibration of a differential pressure gauge, compare Δp readings of the gauge with those of a gauge-oil manometer at a minimum of three points, approximately representing the range of Δp values in the stack. If, at each point, the values of Δp as read by the differential pressure gauge and gauge-oil manometer agree to within 5 per-

cent, the differential pressure gauge shall be considered to be in proper calibration. Otherwise, the test series shall either be voided, or procedures to adjust the measured Δp values and final results shall be used subject to the approval of the Administrator.

2.3 Temperature Gauge. A thermocouple, liquid-filled bulb thermometer, bimetallic thermometer, mercury-in-glass thermometer, or other gauge, capable of measuring temperature to within 1.5 percent of the minimum absolute stack temperature shall be used. The temperature gauge shall be attached to the pitot tube such that the sensor tip does not touch any metal; the gauge shall be in an interference-free arrangement with respect to the pitot tube face openings (see Figure 2-1 and also Figure 2-7 in Section 4). Alternate positions may be used if the pitot tube-temperature gauge system is calibrated according to the procedure of Section 4. Provided that a difference of not more than 1 percent in the average velocity measurement is introduced, the temperature gauge need not be attached to the pitot tube; this alternative is subject to the approval of the Administrator.

2.4 Pressure Probe and Gauge. A piezometer tube and mercury- or water-filled U-tube manometer capable of measuring stack pressure to within 2.5 mm (0.1 in.) Hg is used. The static tap of a standard type pitot tube or one leg of a Type S pitot tube with the face opening planes positioned parallel to the gas flow may also be used as the pressure probe.

2.5 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg) may be used. In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm (0.1 in.) Hg per 30-meter (100 foot) elevation increase or vice-versa for elevation decrease.

2.6 Gas Density Determination Equipment. Method 3 equipment, if needed (see Section 3.6), to determine the stack gas dry molecular weight, and Reference Method 4 or Method 5 equipment for moisture content determination; other methods may be used subject to approval of the Administrator.

2.7 Calibration Pilot Tube. When calibration of the Type S pitot tube is necessary (see Section 4), a standard pitot tube is used as a reference. The standard pitot tube shall, preferably, have a known coefficient, obtained either (1) directly from the National Bureau of Standards, Route 270, Quince Orchard Road, Gaithersburg, Maryland, or (2) by calibration against another standard pitot tube with an NBS-traceable coefficient. Alternatively, a standard pitot tube designed according to the criteria given in 2.7.1 through 2.7.5 below and illustrated in Figure 2-4 (see also Citations 7, 8, and 17 in Section 6) may be used. Pitot tubes designed according to these specifications will have baseline coefficients of about 0.99 ± 0.01.

2.7.1 Hemispherical (shown in Figure 2-4), ellipsoidal, or conical tip.

2.7.2 A minimum of six diameters straight run (based upon D, the external diameter of the tube) between the tip and the static pressure holes.

2.7.3 A minimum of eight diameters straight run between the static pressure holes and the centerline of the external tube, following the 90 degree bend.

2.7.4 Static pressure holes of equal size (approximately 0.1 D), equally spaced in a piezometer ring configuration.

2.7.5 Ninety degree bend, with curved or mitered junction.

2.8 Differential Pressure Gauge for Type S Pitot Tube Calibration. An inclined manometer or equivalent is used. If the single-velocity calibration technique is employed (see Section 4.1.2.3), the calibration differential pressure gauge shall be readable to the nearest 0.13 mm H_2O (0.005 in. H_2O). For multivelocity calibrations, the gauge shall be readable to the nearest 0.13 mm H_2O (0.005 in H_2O) for Δp values between 1.3 and 25 mm H_2O (0.05 and 1.0 in. H_2O), and to the nearest 1.3 mm H_2O (0.05 in. H_2O) for Δp values above 25 mm H_2O (1.0 in. H_2O). A special, more sensitive gauge will be required to read Δp values below 1.3 mm H_2O [0.05 in. H_2O] (see Citation 18 in Section 6).

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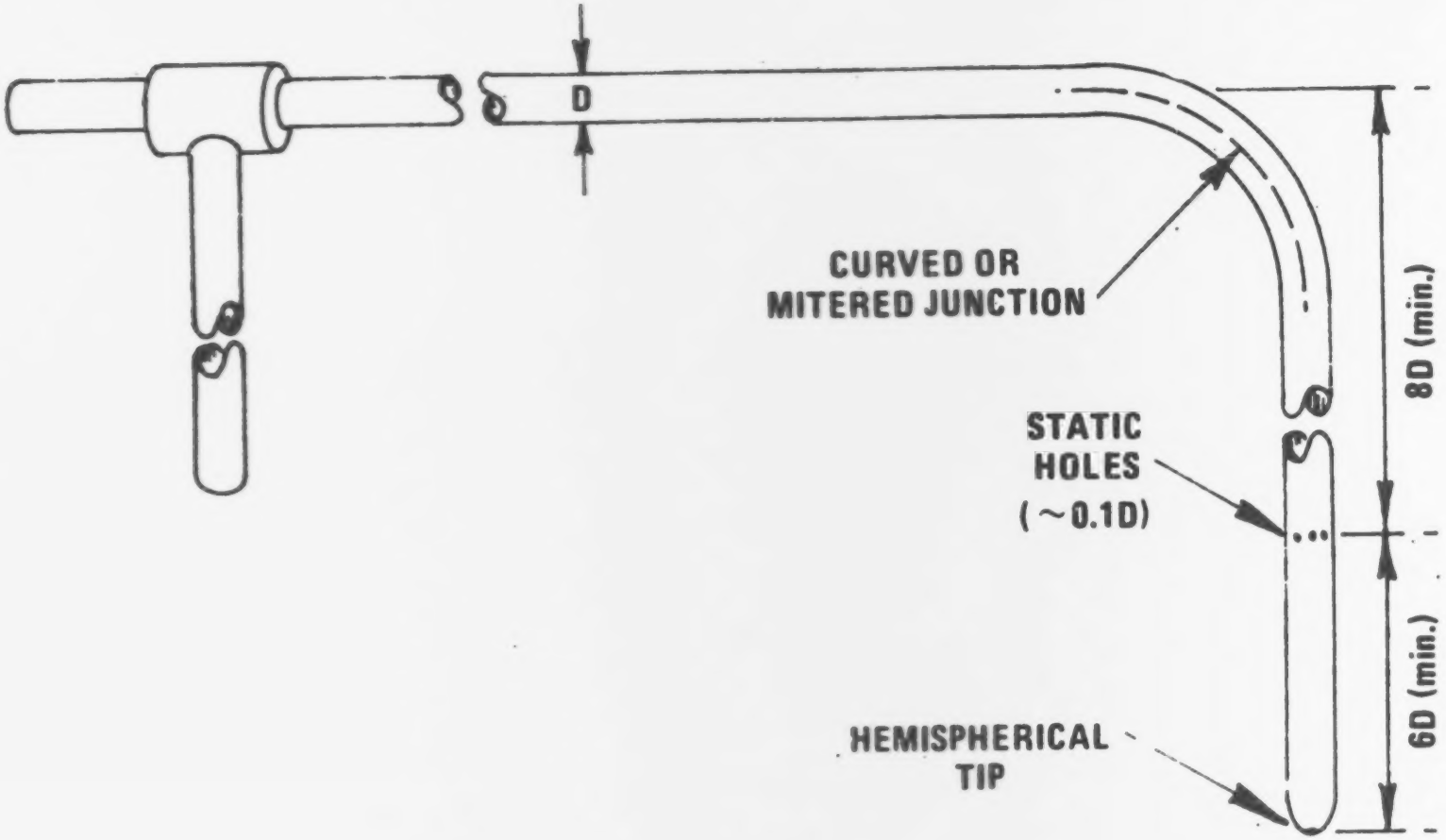

Figure 2-4. Standard pitot tube design specifications.

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3. *Procedure*

3.1 Set up the apparatus as shown in Figure 2-1. Capillary tubing or surge tanks installed between the manometer and pitot tube may be used to dampen Δp fluctuations. It is recommended, but not required, that a pretest leak-check be conducted, as follows: (1) blow through the pitot impact opening until at least 7.6 cm (3 in.) H_2O velocity pressure registers on the manometer; then, close off the impact opening. The pressure shall remain stable for at least 15 seconds; (2) do the same for the static pressure side, except using suction to obtain the minimum of 7.6 cm (3 in.) H_2O. Other leak-check procedures, subject to the approval of the Administrator may be used.

3.2 Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse. Record all necessary data as shown in the example data sheet (Figure 2-5).

3.3 Measure the velocity head and temperature at the traverse points specified by Method 1. Ensure that the proper differential pressure gauge is being used for the range of Δp values encountered (see Section 2.2). If it is necessary to change to a more sensitive gauge, do so, and remeasure the Δp and temperature readings at each traverse point. Conduct a post-test leak-check (mandatory), as described in Section 3.1 above, to validate the traverse run.

3.4 Measure the static pressure in the stack. One reading is usually adequate.

3.5 Determine the atmospheric pressure.

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PLANT _____

DATE _____ RUN NO. _____

STACK DIAMETER OR DIMENSIONS, m(in.) _____

BAROMETRIC PRESSURE, mm Hg (in. Hg) _____

CROSS SECTIONAL AREA, $m^2(ft^2)$ _____

OPERATORS _____

PITOT TUBE I.D. NO. _____

AVG. COEFFICIENT, C_p = _____

LAST DATE CALIBRATED _____

SCHEMATIC OF STACK CROSS SECTION

Traverse Pt. No.	Vel. Hd., Δp mm (in.) H_2O	Stack Temperature		P_g mm Hg (in.Hg)	$\sqrt{\Delta p}$
		t_s, °C (°F)	T_s, °K (°R)		

3.6 Determine the stack gas dry molecular weight. For combustion processes or processes that emit essentially CO_2, O_2, CO, and N_2, use Method 3. For processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0. For other processes, other methods, subject to the approval of the Administrator, must be used.

3.7 Obtain the moisture content from Reference Method 4 (or equivalent) or from Method 5.

3.8 Determine the cross-sectional area of the stack or duct at the sampling location. Whenever possible, physically measure the stack dimensions rather than using blueprints.

4. *Calibration*

4.1 Type S Pitot Tube. Before its initial use, carefully examine the Type S pitot tube in top, side, and end views to verify that the face openings of the tube are aligned within the specifications illustrated in Figure 2-2 or 2-3. The pitot tube shall not be used if it fails to meet these alignment specifications.

After verifying the face opening alignment, measure and record the following dimensions of the pitot tube: (a) the external tubing diameter (dimension D_t, Figure 2-2b); and (b) the base-to-opening plane distances (dimensions P_A and P_B, Figure 2-2b). If D_t is between 0.48 and 0.95 cm (3/16 and 3/8 in.) and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube. Note, however, that if the pitot tube is part of an assembly, calibration may still be required, despite knowledge of the baseline coefficient value (see Section 4.1.1).

If D_t, P_A, and P_B are outside the specified limits, the pitot tube must be calibrated as outlined in 4.1.2 through 4.1.5 below.

4.1.1 Type S Pitot Tube Assemblies. During sample and velocity traverses, the isolated Type S pitot tube is not always used; in many instances, the pitot tube is used in combination with other source-sampling components (thermocouple, sampling probe, nozzle) as part of an "assembly." The presence of other sampling components can sometimes affect the baseline value of the Type S pitot tube coefficient (Citation 9 in Section 6); therefore an assigned (or otherwise known) baseline coefficient value may or may not be valid for a given assembly. The baseline and assembly coefficient values will be identical only when the relative placement of the components in the assembly is such that aerodynamic interference effects are eliminated. Figures 2-6 through 2-8 illustrate interference-free component arrangements for Type S pitot tubes having external tubing diameters between 0.48 and 0.95 cm (3/16 and 3/8 in.). Type S pitot tube assemblies that fail to meet any or all of the specifications of Figures 2-6 through 2-8 shall be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, and prior to calibration, the values of the intercomponent spacings (pitot-nozzle, pitot-thermocouple, pitot-probe sheath) shall be measured and recorded.

NOTE: Do not use any Type S pitot tube assembly which is constructed such that the impact pressure opening plane of the pitot tube is below the entry plane of the nozzle (see Figure 2-6b).

4.1.2 Calibration Setup. If the Type S pitot tube is to be calibrated, one leg of the tube shall be permanently marked A, and the other, B. Calibration shall be done in a flow system having the following essential design features:

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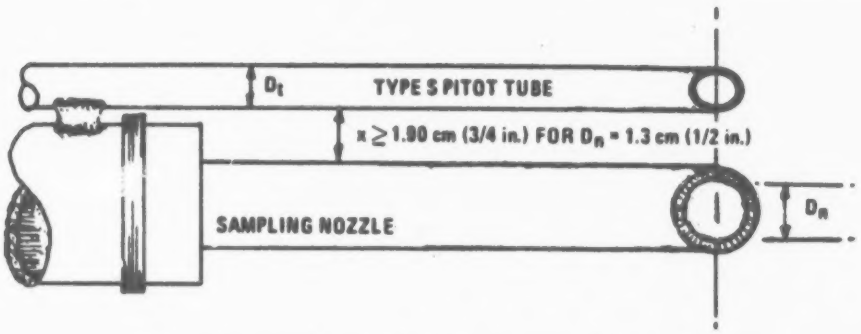
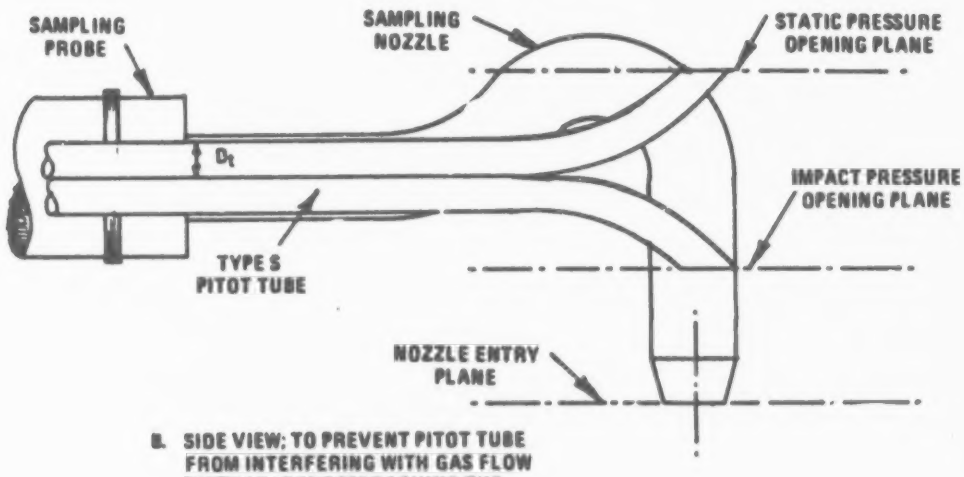


A. BOTTOM VIEW; SHOWING MINIMUM PITOT-NOZZLE SEPARATION.



B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

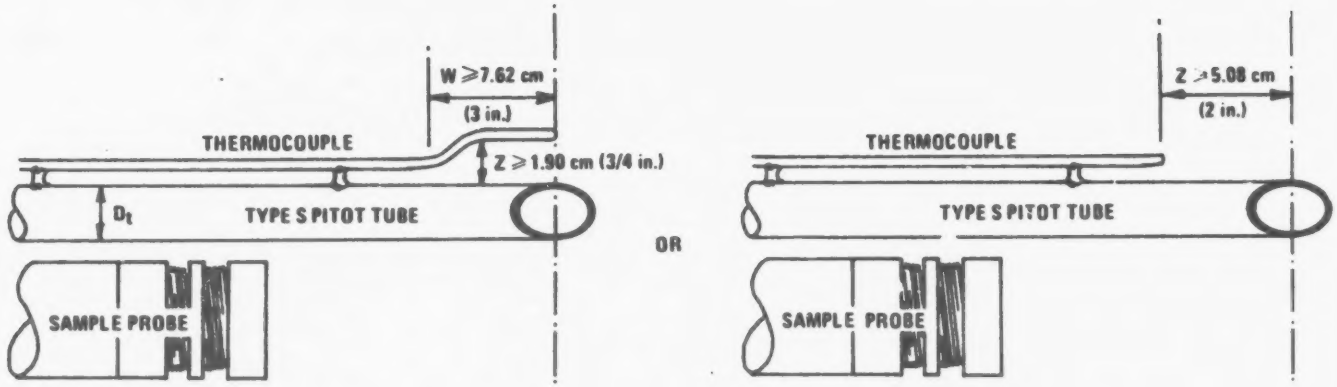


Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

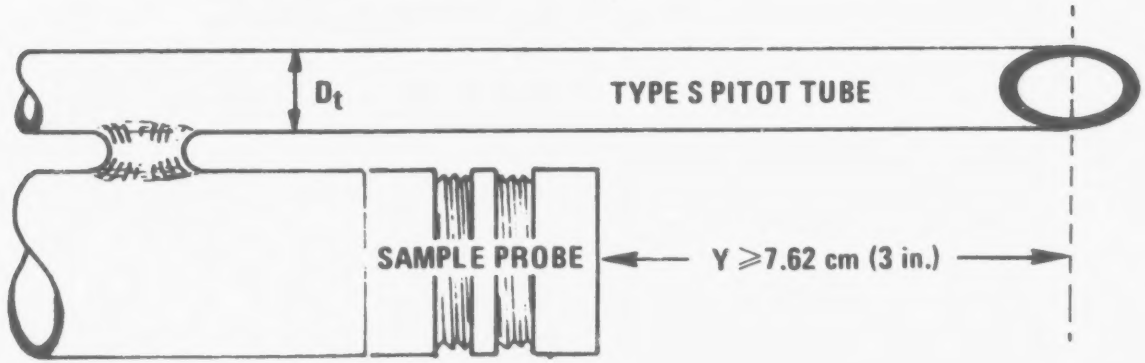


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

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4.1.2.1 The flowing gas stream must be confined to a duct of definite cross-sectional area, either circular or rectangular. For circular cross-sections, the minimum duct diameter shall be 30.5 cm (12 in.); for rectangular cross-sections, the width (shorter side) shall be at least 25.4 cm (10 in.).

4.1.2.2 The cross-sectional area of the calibration duct must be constant over a distance of 10 or more duct diameters. For a rectangular cross-section, use an equivalent diameter, calculated from the following equation, to determine the number of duct diameters:

$$D_e = \frac{2LW}{(L+W)}$$

Equation 2-1

where:
D_e = Equivalent diameter
L = Length
W = Width

To ensure the presence of stable, fully developed flow patterns at the calibration site, or "test section," the site must be located at least eight diameters downstream and two diameters upstream from the nearest disturbances.

NOTE: The eight- and two-diameter criteria are not absolute; other test section locations may be used (subject to approval of the Administrator), provided that the flow at the test site is stable and demonstrably parallel to the duct axis.

4.1.2.3 The flow system shall have the capacity to generate a test-section velocity around 915 m/min (3,000 ft/min). This velocity must be constant with time to guarantee steady flow during calibration. Note that Type S pitot tube coefficients obtained by single-velocity calibration at 915 m/min (3,000 ft/min) will generally be valid to within ±3 percent for the measurement of velocities above 305 m/min (1,000 ft/min) and to within ±5 to 6 percent for the measurement of velocities between 180 and 305 m/min (600 and 1,000 ft/min). If a more precise correlation between C_p and velocity is desired, the flow system shall have the capacity to generate at least four distinct, time-invariant test-section velocities covering the velocity range from 180 to 1,525 m/min (600 to 5,000 ft/min), and calibration data shall be taken at regular velocity intervals over this range (see Citations 9 and 14 in Section 6 for details).

4.1.2.4 Two entry ports, one each for the standard and Type S pitot tubes, shall be cut in the test section; the standard pitot entry port shall be located slightly downstream of the Type S port, so that the standard and Type S impact openings will lie in the same cross-sectional plane during calibration. To facilitate alignment of the pitot tubes during calibration, it is advisable that the test section be constructed of plexiglas or some other transparent material.

4.1.3 Calibration Procedure. Note that this procedure is a general one and must not be used without first referring to the special considerations presented in Section 4.1.5. Note also that this procedure applies only to single-velocity calibration. To obtain calibration data for the A and B sides of the Type S pitot tube, proceed as follows:

4.1.3.1 Make sure that the manometer is properly filled and that the oil is free from contamination and is of the proper density. Inspect and leak-check all pitot lines; repair or replace if necessary.

4.1.3.2 Level and zero the manometer. Turn on the fan and allow the flow to stabilize. Seal the Type S entry port.

4.1.3.3 Ensure that the manometer is level and zeroed. Position the standard pitot tube at the calibration point (determined as outlined in Section 4.1.5.1), and align the tube so that its tip is pointed directly into the flow. Particular car should be taken in aligning the tube to avoid yaw and pitch angles. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.4 Read Δp_{std} and record its value in a data table similar to the one shown in Figure 2-9. Remove the standard pitot tube from the duct and disconnect it from the manometer. Seal the standard entry port.

4.1.3.5 Connect the Type S pitot tube to the manometer. Open the Type S entry port. Check the manometer level and zero. Insert and align the Type S pitot tube so that its A side impact opening is at the same point as was the standard pitot tube and is pointed directly into the flow. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.6 Read Δp_s and enter its value in the data table. Remove the Type S pitot tube from the duct and disconnect it from the manometer.

4.1.3.7 Repeat steps 4.1.3.3 through 4.1.3.6 above until three pairs of Δp readings have been obtained.

4.1.3.8 Repeat steps 4.1.3.3 through 4.1.3.7 above for the B side of the Type S pitot tube.

4.1.3.9 Perform calculations, as described in Section 4.1.4 below.

4.1.4 Calculations.

4.1.4.1 For each of the six pairs of Δp readings (i.e., three from side A and three from side B) obtained in Section 4.1.3 above, calculate the value of the Type S picot tube coeffficient as follows:

PITOT TUBE IDENTIFICATION NUMBER: _____ DATE: _____

CALIBRATED BY: _____

	"A" SIDE CALIBRATION			
RUN NO.	Δp_{std} cm H_2O (in. H_2O)	$\Delta p_{(s)}$ cm H_2O (in. H_2O)	$C_{p(s)}$	DEVIATION $C_{p(s)} - \bar{C}_p(A)$
1				
2				
3				
		$\bar{C}_p$ (SIDE A)		

	"B" SIDE CALIBRATION			
RUN NO.	Δp_{std} cm H_2O (in. H_2O)	$\Delta p_{(s)}$ cm H_2O (in. H_2O)	$C_{p(s)}$	DEVIATION $C_{p(s)} - \bar{C}_p(B)$
1				
2				
3				
		$\bar{C}_p$ (SIDE B)		

$$\text{AVERAGE DEVIATION} = \sigma\,(\text{A OR B}) = \frac{\sum_{1}^{3} \left| C_{p(s)} - \bar{C}_p(\text{A OR B}) \right|}{3} \leftarrow \text{MUST BE} \leq 0.01$$

$$\left| \bar{C}_p\,(\text{SIDE A}) - \bar{C}_p\,(\text{SIDE B}) \right| \leftarrow \text{MUST BE} \leq 0.01$$

Figure 2-9. Pitot tube calibration data.

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$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$

Equation 2-2

where:

$C_{p(s)}$ = Type S pitot tube coefficient

$C_{p(std)}$ = Standard pitot tube coefficient; use 0.99 if the coefficient is unknown and the tube is designed according to the criteria of Sections 2.7.1 to 2.7.5 of this method.

Δp_{std} = Velocity head measured by the standard pitot tube, cm H_2O (in. H_2O)

Δp_s = Velocity head measured by the Type S pitot tube, cm H_2O (in H_2O)

4.1.4.2 Calculate C_p (side A), the mean A-side coefficient, and C_p (side B), the mean B-side coefficient; calculate the difference between these two average values.

4.1.4.3 Calculate the deviation of each of the three A-side values of $C_{p(s)}$ from C_p (side A), and the deviation of each B-side value of $C_{p(s)}$ from C_p (side B). Use the following equation:

$$\text{Deviation} = C_{p(s)} - \overline{C}_p(\text{A or B})$$

Equation 2-3

4.1.4.4 Calculate δ, the average deviation from the mean, for both the A and B sides of the pitot tube. Use the following equation:

$$\sigma\ (\text{side A or B}) = \frac{\sum_{1}^{3} |C_{p(s)} - \overline{C}_p(A \text{ or } B)|}{3}$$

Equation 2-4

4.1.4.5 Use the Type S pitot tube only if the values of δ (side A) and δ (side B) are less than or equal to 0.01 and if the absolute value of the difference between C_p (A) and C_p (B) is 0.01 or less.

4.1.5 Special considerations.

4.1.5.1 Selection of calibration point.

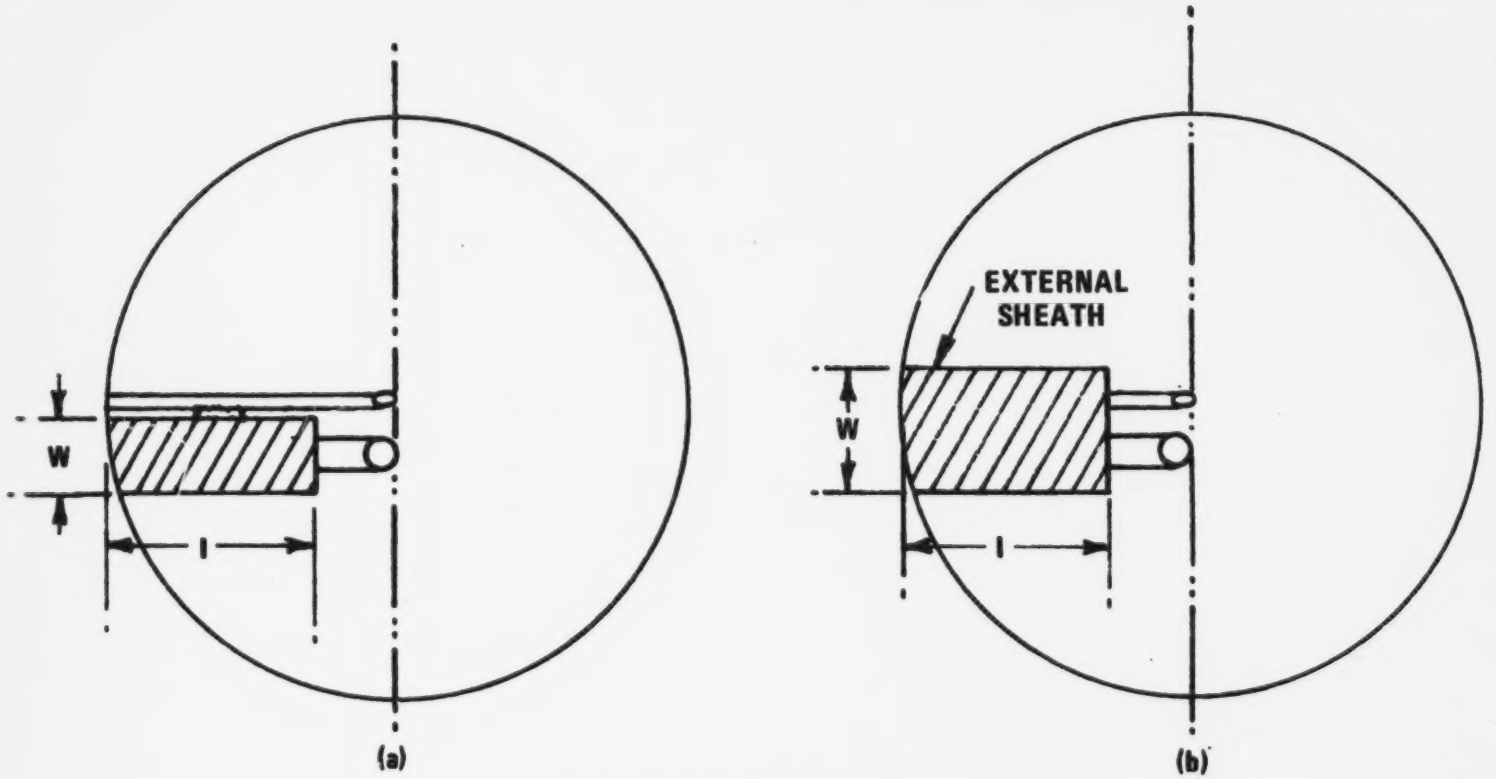
4.1.5.1.1 When an isolated Type S pitot tube is calibrated, select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The Type S pitot coefficients so obtained, i.e., C_p (side A) and C_p (side B), will be valid, so long as either: (1) the isolated pitot tube is used; or (2) the pitot tube is used with other components (nozzle, thermocouple, sample probe) in an arrangement that is free from aerodynamic interference effects (see Figures 2-6 through 2-8).

4.1.5.1.2 For Type S pitot tube-thermocouple combinations (without sample probe), select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The coefficients so obtained will be valid so long as the pitot tube-thermocouple combination is used by itself or with other components in an interference-free arrangement (Figures 2-6, and 2-8).

4.1.5.1.3 For assemblies with sample probes, the calibration point should be located at or near the center of the duct; however, insertion of a probe sheath into a small duct may cause significant cross-sectional area blockage and yield incorrect coefficient values (Citation 9 in Section 6). Therefore, to minimize the blockage effect, the calibration point may be a few inches off-center if necessary. The actual blockage effect will be negligible when the theoretical blockage, as determined by a projected-area model of the probe sheath, is 2 percent or less of the duct cross-sectional area for assemblies without external sheaths (Figure 2-10a), and 3 percent or less for assemblies with external sheaths (Figure 2-10b).

4.1.5.2 For those probe assemblies in which pitot tube-nozzle interference is a factor (i.e., those in which the pitot-nozzle separation distance fails to meet the specification illustrated in Figure 2-6a), the value of $C_{p(s)}$ depends upon the amount of free-space between the tube and nozzle, and therefore is a function of nozzle size. In these instances, separate calibrations shall be performed with each of the commonly used nozzle sizes in place. Note that the single-velocity calibration technique is acceptable for this purpose, even though the larger nozzle sizes (>0.635 cm or ¼ in.) are not ordinarily used for isokinetic sampling at velocities around 915 m/min (3,000 ft/min), which is the calibration velocity; note also that it is not necessary to draw an isokinetic sample during calibration (see Citation 19 in Section 6).

4.1.5.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation (δ) value of 0.01 or less (see Section 4.1.4.4).



$$\text{ESTIMATED SHEATH BLOCKAGE (\%)} = \left[\frac{l \times W}{\text{DUCT AREA}}\right] \times 100$$

Figure 2-10. Projected-area models for typical pitot tube assemblies.

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Figure 2-10. Projected-area models for typical pitot tube assemblies.

4.1.6 Field Use and Recalibration.

4.1.6.1 Field Use.

4.1.6.1.1 When a Type S pitot tube (isolated tube or assembly) is used in the field, the appropriate coefficient value (whether assigned or obtained by calibration) shall be used to perform velocity calculations. For calibrated Type S pitot tubes, the A side coefficient shall be used when the A side of the tube faces the flow, and the B side coefficient shall be used when the B side faces the flow; alternatively, the arithmetic average of the A and B side coefficient values may be used, irrespective of which side faces the flow.

4.1.6.1.2 When a probe assembly is used to sample a small duct (12 to 36 in. in diameter), the probe sheath sometimes blocks a significant part of the duct cross-section, causing a reduction in the effective value of $C_{p(s)}$. Consult Citation 9 in Section 6 for details. Conventional pitot-sampling probe assemblies are not recommended for use in ducts having inside diameters smaller than 12 inches (Citation 16 in Section 6).

4.1.6.2 Recalibration.

4.1.6.2.1 Isolated Pitot Tubes. After each field use, the pitot tube shall be carefully reexamined in top, side, and end views. If the pitot face openings are still aligned within the specifications illustrated in Figure 2-2 or 2-3, it can be assumed that the baseline coefficient of the pitot tube has not changed. If, however, the tube has been damanged to the extent that it no longer meets the specifications of Figure 2-2 or 2-3, the damage shall either be repaired to restore proper alignment of the face openings or the tube shall be discarded.

4.1.6.2.2 Pitot Tube Assemblies. After each field use, check the face opening alignment of the pitot tube, as in Section 4.1.6.2.1; also, remeasure the intercomponent spacings of the assembly. If the intercomponent spacings have not changed and the face opening alignment is acceptable, it can be assumed that the coefficient of the assembly has not changed. If the face opening alignment is no longer within the specifications of Figures 2-2 or 2-3, either repair the damage or replace the pitot tube (calibrating the new assembly, if necessary). If the intercomponent spacings have changed, restore the original spacings or recalibrate the assembly.

4.2 Standard pitot tube (if applicable). If a standard pitot tube is used for the velocity traverse, the tube shall be constructed according to the criteria of Section 2.7 and shall be assigned a baseline coefficient value of 0.99. If the standard pitot tube is used as part of an assembly, the tube shall be in an interference-free arrangement (subject to the approval of the Administrator).

4.3 Temperature Gauges. After each field use, calibrate dial thermometers, liquid-filled bulb thermometers, thermocouple-potentiometer systems, and other gauges at a temperature within 10 percent of the average absolute stack temperature. For temperatures up to 405° C (761° F), use an ASTM mercury-in-glass reference thermometer, or equivalent, as a reference; alternatively, either a reference thermocouple and potentiometer (calibrated by NBS) or thermometric fixed points, e.g., ice bath and boiling water (corrected for barometric pressure) may be used. For temperatures above 405° C (761° F), use an NBS-calibrated reference thermocouple-potentiometer system or an alternate reference, subject to the approval of the Administrator.

If, during calibration, the absolute temperatures measured with the gauge being calibrated and the reference gauge agree within 1.5 percent, the temperature data taken in the field shall be considered valid. Otherwise, the pollutant emission test shall either be considered invalid or adjustments (if appropriate) of the test results shall be made, subject to the approval of the Administrator.

4.4 Barometer. Calibrate the barometer used against a mercury barometer.

5. *Calculations*

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

5.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.

C_p = Pitot tube coefficient, dimensionless.

K_p = Pitot tube constant,

$$34.97 \frac{\text{m}}{\text{sec}} \left[\frac{(g/g\text{-mole})(\text{mm Hg})}{(°\text{K})(\text{mm } H_2O)} \right]^{1/2}$$

for the metric system and

$$85.49 \frac{\text{ft}}{\text{sec}} \left[\frac{(\text{lb/lb-mole})(\text{in. Hg})}{(°\text{R})(\text{in. } H_2O)} \right]^{1/2}$$

for the English system.

M_d = Molecular weight of stack gas, dry basis (see Section 3.6) g/g-mole (lb/lb-mole).

M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$= M_d (1 - B_{ws}) + 18.0 B_{ws}$

Equation 2-5

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).
P_g = Stack static pressure, mm Hg (in. Hg).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).
$= P_{bar} + P_g$

Equation 2-6

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr).
t_s = Stack temperature, °C (°F).
T_s = Absolute stack temperature, °K, (°R).
$= 273 + t_s$ for metric

Equation 2-7

$= 460 + t_s$ for English

Equation 2-8

T_{std} = Standard absolute temperature, 293 °K (528° R)
v_s = Average stack gas velocity, m/sec (ft/sec).
Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O).
3,600 = Conversion factor, sec/hr.
18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

5.2 Average stack gas velocity.

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

Equation 2-9

5.3 Average stack gas dry volumetric flow rate.

$$Q_{sd} = 3{,}600\ (1 - B_{ws}) v_s A \left(\frac{T_{std}}{T_{s(avg)}}\right)\left(\frac{P_s}{P_{std}}\right)$$

Equation 2-10

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METHOD 3—GAS ANALYSIS FOR CARBON DIOXIDE, OXYGEN, EXCESS AIR, AND DRY MOLECULAR WEIGHT

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted from a stack, by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent carbon dioxide (CO_2), percent oxygen (O_2), and, if necessary, percent carbon monoxide (CO). If a dry molecular weight determination is to be made, either an Orsat or a Fyrite [1] analyzer may be used for the analysis; for excess air or emission rate correction factor determination, an Orsat analyzer must be used.

1.2 Applicability. This method is applicable for determining CO_2 and O_2 concentrations, excess air, and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process. The method may also be applicable to other processes where it has been determined that compounds other than CO_2, O_2, CO, and nitrogen (n_2) are not present in concentrations sufficient to affect the results.

Other methods, as well as modifications to the procedure described herein, are also applicable for some or all of the above determinations. Examples of specific methods and modifications include: (1) a multi-point sampling method using an Orsat analyzer to analyze individual grab samples obtained at each point; (2) a method using CO_2 or O_2 and stoichiometric calculations to determine dry molecular weight and excess air; (3) assigning a value of 30.0 for dry molecular weight, in lieu of actual measurements, for processes burning natural gas, coal, or oil. These methods and modifications may be used, but are subject to the approval of the Administrator, U.S. Environmental Protection Agency.

2. *Apparatus*

As an alternative to the sampling apparatus and systems described herein, other sampling systems (e.g., liquid displacement) may be used provided such systems are capable of obtaining a representative sample and maintaining a constant sampling rate, and are otherwise capable of yielding acceptable results. Use of such systems is subject to the approval of the Administrator.

2.1 Grab Sampling (Figure 3-1).

2.1.1 Probe. The probe should be made of stainless steel or borosilicate glass tubing and should be equipped with an in-stack or out-stack filter to remove particulate matter (a plug of glass wool is satisfactory for this purpose). Any other materials inert to O_2, CO_2, CO, and N_2 and resistant to temperature at sampling conditions may be used for the probe; examples of such material are aluminum, copper, quartz glass and Teflon.

2.1.2 Pump. A one-way squeeze bulb, or equivalent, is used to transport the gas sample to the analyzer.

2.2 Integrated Sampling (Figure 3-2).

2.2.1 Probe. A probe such as that described in Section 2.1.1 is suitable.

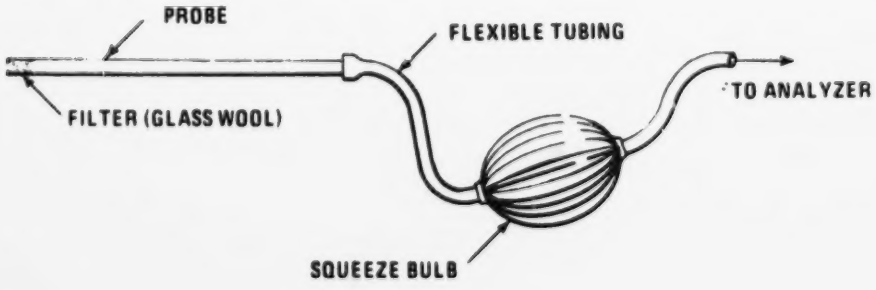

Figure 3-1. Grab sampling train.

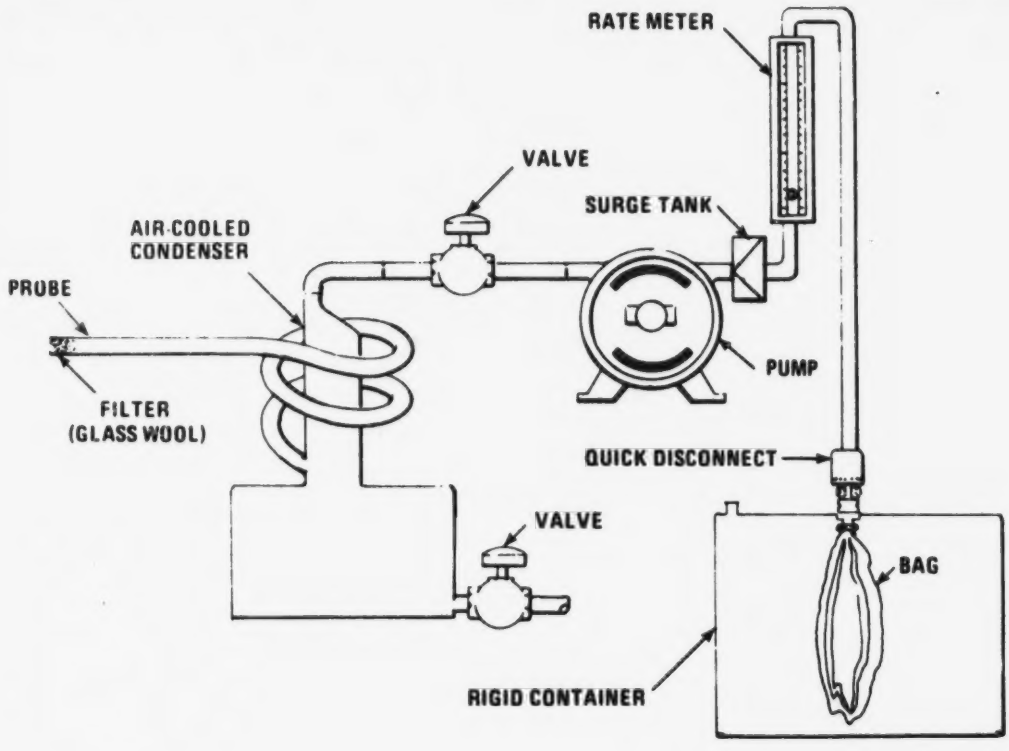

Figure 3-2. Integrated gas-sampling train.

2.2.2 Condenser. An air-cooled or water-cooled condenser, or other condenser that will not remove O_2, CO_2, CO, and N_2, may be used to remove excess moisture which would interfere with the operation of the pump and flow meter.

2.2.3 Valve. A needle valve is used to adjust sample gas flow rate.

2.2.4 Pump. A leak-free, diaphragm-type pump, or equivalent, is used to transport sample gas to the flexible bag. Install a small surge tank between the pump and rate meter to eliminate the pulsation effect of the diaphragm pump on the rotameter.

2.2.5 Rate Meter. The rotameter, or equivalent rate meter, used should be capable of measuring flow rate to within ±2 percent of the selected flow rate. A flow rate range of 500 to 1000 cm^3/min is suggested.

2.2.6 Flexible Bag. Any leak-free plastic (e.g., Tedlar, Mylar, Teflon) or plastic-coated aluminum (e.g., aluminized Mylar) bag, or equivalent, having a capacity consistent with the selected flow rate and time length of the test run, may be used. A capacity in the range of 55 to 90 liters is suggested.

To leak-check the bag, connect it to a water manometer and pressurize the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O). Allow to stand for 10 minutes. Any displacement in the water manometer indicates a leak. An alternative leak-check method is to pressurize the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O) and allow to stand overnight. A deflated bag indicates a leak.

2.2.7 Pressure Gauge. A water-filled U-tube manometer, or equivalent, of about 28 cm (12 in.) is used for the flexible bag leak-check.

2.2.8 Vacuum Gauge. A mercury manometer, or equivalent, of at least 760 mm Hg (30 in. Hg) is used for the sampling train leak-check.

2.3 Analysis. For Orsat and Fyrite analyzer maintenance and operation procedures, follow the instructions recommended by the manufacturer, unless otherwise specified herein.

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2.3.1 Dry Molecular Weight Determination. An Orsat analyzer or Fyrite type combustion gas analyzer may be used.

2.3.2 Emission Rate Correction Factor or Excess Air Determination. An Orsat analyzer must be used. For low CO_2 (less than 4.0 percent) or high O_2 (greater that 15.0 percent) concentrations, the measuring burette of the Orsat must have at least 0.1 percent subdivisions.

3. *Dry Molecular Weight Determination*

Any of the three sampling and analytical procedures described below may be used for determining the dry molecular weight.

3.1 Single-Point, Grab Sampling and Analytical Procedure.

3.1.1 The sampling point in the duct shall either be at the centroid of the cross section or at a point no closer to the walls than 1.00 m (3.3 ft), unless otherwise specified by the Administrator.

3.1.2 Set up the equipment as shown in Figure 3-1, making sure all connections ahead of the analyzer are tight and leak-free. If and Orsat analyzer is used, it is recommended that the analyzer be leaked-checked by following the procedure in Section 5; however, the leak-check is optional.

3.1.3 Place the probe in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Draw a sample into the analyzer and immediately analyze it for percent CO_2 and percent O_2. Determine the percentage of the gas that is N_2 and CO by subtracting the sum of the percent CO_2 and percent O_2 from 100 percent. Calculate the dry molecular weight as indicated in Section 6.3.

3.1.4 Repeat the sampling, analysis, and calculation procedures, until the dry molecular weights of any three grab samples differ from their mean by no more than 0.3 g/g-mole (0.3 lb/lb-mole). Average these three molecular weights, and report the results to the nearest 0.1 g/g-mole (lb/lb-mole).

3.2 Single-Point, Integrated Sampling and Analytical Procedure.

3.2.1 The sampling point in the duct shall be located as specified in Section 3.1.1.

3.2.2 Leak-check (optional) the flexible bag as in Section 2.2.6. Set up the equipment as shown in Figure 3-2. Just prior to sampling, leak-check (optional) the train by placing a vacuum gauge at the condenser inlet, pulling a vacuum of at least 250 mm Hg (10 in. Hg), plugging the outlet at the quick disconnect, and then turning off the pump. The vacuum should remain stable for at least 0.5 minute. Evacuate the flexible bag. Connect the probe and place it in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Next, connect the bag and make sure that all connections are tight and leak free.

3.2.3 Sample at a constant rate. The sampling run should be simultaneous with, and for the same total length of time as, the pollutant emission rate determination. Collection of at least 30 liters (1.00 ft^3) of sample gas is recommended; however, smaller volumes may be collected, if desired.

3.2.4 Obtain one integrated flue gas sample during each pollutant emission rate determination. Within 8 hours after the sample is taken, analyze it for percent CO_2 and percent O_2 using either an Orsat analyzer or a Fyrite-type combustion gas analyzer. If an Orsat analyzer is used, it is recommended that the Orsat leak-check described in Section 5 be performed before this determination; however, the check is optional. Determine the percentage of the gas that is N_2 and CO by subtracting the sum of the percent CO_2 and percent O_2 from 100 percent. Calculate the dry molecular weight as indicated in Section 6.3.

3.2.5 Repeat the analysis and calculation procedures until the individual dry molecular weights for any three analyses differ from their mean by no more than 0.3 g/g-mole (0.3 lb/lb-mole). Average these three molecular weights, and report the results to the nearest 0.1 g/g-mole (0.1 lb/lb-mole).

3.3 Multi-Point, Integrated Sampling and Analytical Procedure.

3.3.1 Unless otherwise specified by the Administrator, a minimum of eight traverse points shall be used for circular stacks having diameters less than 0.61 m (24 in.), a minimum of nine shall be used for rectangular stacks having equivalent diameters less than 0.61 m (24 in.), and a minimum of twelve traverse points shall be used for all other cases. The traverse points shall be located according to Method 1. The use of fewer points is subject to approval of the Administrator.

3.3.2 Follow the procedures outlined in sections 3.2.2 throught 3.2.5, except for the following: traverse all sampling points and sample at each point for an equal length of time. Record sampling data as shown in Figure 3-3.

4. *Emission Rate Correction Factor or Excess Air Determination*

NOTE: A Fyrite-type combustion gas analyzer is not acceptable for excess air or emission rate correction factor determination, unless approved by the Administrator. If both percent CO_2 and percent O_2 are measured, the analytical results of any of the three procedures given below may also be used for calculating the dry molecular weight.

Each of the three procedures below shall be used only when specified in an applicable subpart of the standards. The use of these procedures for other purposes must have specific prior approval of the Administrator.

4.1 Single-Point, Grab Sampling and Analytical Procedure.

4.1.1 The sampling point in the duct shall either be at the centroid of the cross-section or at a point no closer to the walls than 1.00 m (3.3 ft), unless otherwise specified by the Administrator.

4.1.2 Set up the equipment as shown in Figure 3-1, making sure all connections ahead of the analyzer are tight and leak-free. Leak-check the Orsat analyzer according to the procedure described in Section 5. This leak-check is mandatory.

TIME	TRAVERSE PT.	Q 1pm	% DEV.[a]
	AVERAGE		

[a] $\%\ DEV = \left(\frac{Q - Q_{avg}}{Q_{avg}}\right) 100$ (MUST BE ≤10%)

Figure 3-3. Sampling rate data.

4.1.3 Place the probe in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Draw a sample into the analyzer. For emission rate correction factor determination, immediately analyze the sample, as outlined in Sections 4.1.4 and 4.1.5, for percent CO_2 or percent O_2. If excess air is desired, proceed as follows: (1) immediately analyze the sample, as in Sections 4.1.4 and 4.1.5, for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent; and (3) calculate percent excess air as outlined in Section 6.2.

4.1.4 To insure complete absorption of the CO_2, O_2, or if applicable, CO, make repeated passes through each absorbing solution until two consecutive readings are the same. Several passes (three or four) should be made between readings. (If constant readings cannot be obtained after three consecutive readings, replace the absorbing solution.)

4.1.5 After the analysis is completed, leak-check (mandatory) the Orsat analyzer once again, as described in Section 5. For the results of the analysis to be valid, the Orsat analyzer must pass this leak test before and after the analysis.

NOTE: Since this single-point, grab sampling and analytical procedure in normally conducted in conjunction with a single-point, grab sampling and analytical procedure for a pollutant, only one analysis is ordinarily conducted. Therefore, great care must be taken to obtain a valid sample and analysis. Although in most cases only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Citation 5 in the Bibliography be used to validate the analytical data.

4.2 Single-Point, Integrated Sampling and Analytical Procedure.

4.2.1 The sampling point in the duct shall be located as specified in Section 4.1.1.

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4.2.2 Leak-check (mandatory) the flexible bag as in Section 2.2.6. Set up the equipment as shown in Figure 3-2. Just prior to sampling, leak-check (mandatory) the train by placing a vacuum gauge at the condenser inlet, pulling a vacuum of a least 250 mm Hg (10 in. Hg), plugging the outlet at the quick disconnect, and then turning off the pump. The vacuum shall remain stable for at least 0.5 minute. Evacuate the flexible bag. Connect the probe and place it in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Next, connect the bag and make sure that all connections are tight and leak free.

4.2.3 Sample at a constant rate, or as specified by the Administrator. The sampling run must be simultaneous with, and for the same total lengh of time as, the pollutant emission rate determination. Collect at least 30 liters (1.00 ft^3) of sample gas. Smaller volumes may be collected, subject to approval of the Administrator.

4.2.4 Obtain one integrated flue gas sample during each pollutant emission rate determination. For emission rate correction factor determination, analyze the sample within 4 hours after it is taken for percent CO_2 or percent O_2 (as outlined in Sections 4.2.5 through 4.2.7). The Orsat analyzer must be leak-check (see Section 5) before the analysis. If excess air is desired, proceed as follows: (1) within 4 hours after the sample is taken, analyze it (as in Sections 4.2.5 through 4.2.7) for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent; (3) calculate percent excess air, as outlined in Section 6.2.

4.2.5 To insure complete absorption of the CO_2, O_2, or if applicable, CO, make repeated passes through each absorbing solution until two consecutive readings are the same. Several passes (three of four) should be make between readings. (If constant readings cannot be obtained after three consecutive readings, replace the absorbing solution.)

4.2.6 Repeat the analysis until the following criteria are met:

4.2.6.1 For percent CO_2, repeat the analytical procedure until the results of any three analyses differ by no more that (a) 0.3 percent by volume when CO_2 is greater than 4.0 percent or (b) 0.2 percent by volume when CO_2 is less than or equal to 4.0 percent. Average the three acceptable values of percent CO_2 and report the results to the nearest 0.1 percent.

4.2.6.2 For percent O_2, repeat the analytical procedure until the results of any three analyses differ by no more than (a) 0.3 percent by volume when O_2 is less than 15.0 percent or (b) 0.2 percent by volume when O_2 is greater than or equal to 15.0 percent. Average the three acceptable values of percent O_2 and report the results to the nearest 0.1 percent.

4.2.6.3 For percent CO, repeat the analytical procedure until the results of any three analyses differ by no more than 0.3 percent. Average the three acceptable values of percent CO and report the results to the nearest 0.1 percent.

4.2.7 After the analysis is completed, leak-check (mandatory) the Orsat analyzer once again, as described in Section 5. For the results of the analysis to be valid, the Orsat analyzer must pass this leak test before an after the analysis.

NOTE: Although in most instances only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Citation 5 in the Bibliography be used to validate the analytical data.

4.3 Multi-Point, Integrated Sampling and Analytical Procedure.

4.3.1 Both the minimum number of sampling points and the sampling point location shall be as specified in Section 3.3.1 of this method. The use of fewer points than specified is subject to the approval of the Administrator.

4.3.2 Follow the procedures outlined in Sections 4.2.2 through 4.2.7, except for the following: Traverse all sampling points and sample at each point for an equal length of time. Record sampling data as shown in Figure 3-3.

5. *Leak-Check Procedure for Orsat Analyzers*

Moving an Orsat analyzer frequently causes it to leak. Therefore, an Orsat analyzer should be throughly leak-checked on site before the flue gas sample is introduced into it. The procedure for leak-checking an Orsat analyzer is:

5.1.1 Bring the liquid level in each pipette up to the reference mark on the capillary tubing and then close the pipette stopcock.

5.1.2 Raise the leveling bulb sufficiently to bring the confining liquid meniscus onto the graduated portion of the burette and then close the manifold stopcock.

5.1.3 Record the meniscus position.

5.1.4 Observe the menicus in the burette and the liquid level in the pipette for movement over the next 4 minutes.

5.1.5 For the Orsat analyzer to pass the leak-check, two conditions must be met.

5.1.5.1 The liquid level in each pipette must not fall below the bottom of the capillary tubing during this 4-minute interval.

5.1.5.2 The meniscus in the burette must not change by more than 0.2 ml during this 4-minute interval.

5.1.6 If the analyzer fails the leak-check procedure, all rubber connections and stopcocks should be checked until the cause of the leak is identified. Leaking stopcocks must be disassembled, cleaned, and re-

greased. Leaking rubber connections must be replaced. After the analyzer is reassembled, the leak-check procedure must be repeated.

6. *Calculations*

6.1 Nomenclature.

M_d = Dry molecular weight, g/g-mole (lb/lb-mole).
%EA = Percent excess air.
$\%CO_2$ = Percent CO_2 by volume (dry basis).
$\%O_2$ = Percent O_2 by volume (dry basis).
%CO = Percent CO by volume (dry basis).
$\%N_2$ = Percent N_2 by volume (dry basis).
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.280 = Molecular weight of N_2 or CO, divided by 100.
0.320 = Molecular weight of O_2 divided by 100.
0.440 = Molecular weight of CO_2 divided by 100.

6.2 Percent Excess Air. Calculate the percent excess air (if applicable), by substituting the appropriate values of percent O_2, CO, and N_2 (obtained from Section 4.1.3 or 4.2.4) into Equation 3-1.

$$\%EA = \left[\frac{\%O_2 - 0.5\%CO}{0.264\%N_2 - (\%O_2 - 0.5\%CO)}\right]100$$

Equation 3-1

NOTE: The equation above assumes that ambient air is used as the source of O_2 and that the fuel does not contain appreciable amounts of N_2 (as do coke oven or blast furnace gases). For those cases when appreciable amounts of N_2 are present (coal, oil, and natural gas do not contain appreciable amounts of N_2) or when oxygen enrichment is used, alternate methods, subject to approval of the Administrator, are required.

6.3 Dry Molecular Weight. Use Equation 3-2 to calculate the dry molecular weight of the stack gas

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

Equation 3-2

NOTE: The above equation does not consider argon in air (about 0.9 percent, molecular weight of 37.7). A negative error of about 0.4 percent is introduced. The tester may opt to include argon in the analysis using procedures subject to approval of the Administrator.

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METHOD 4—DETERMINATION OF MOISTURE CONTENT IN STACK GASES

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

1.2 Applicability. This method is applicable for determining the moisture content of stack gas.

Two procedures are given. The first is a reference method, for accurate determinations of moisture content (such as are needed to calculate emission data). The second is an approximation method, which provides estimates of percent moisture to aid in setting isokinetic sampling rates prior to a pollutant emission measurement run. The approximation method described herein is only a suggested approach; alternative means for approximating the moisture content, e.g., drying tubes, wet bulb-dry bulb techniques, condensation techniques, stoichiometric calculations, previous experience, etc., are also acceptable.

The reference method is often conducted simultaneously with a pollutant emission measurement run; when it is, calculation of percent isokinetic, pollutant emission rate, etc., for the run shall be based upon the results of the reference method or its equivalent; these calculations shall not be based upon the results of the approximation method, unless the approximation method is shown, to the satisfaction of the Administrator, U.S. Environmental Protection Agency, to be capable of yielding results within 1 percent H_2O of the reference method.

NOTE: The reference method may yield questionable results when applied to saturated gas streams or to streams that contain water droplets. Therefore, when these conditions exist or are suspected, a second determination of the moisture content shall be made simultaneously with the reference method, as follows: Assume that the gas stream is saturated. Attach a temperature

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sensor [capable of measuring to ±1° C (2° F)] to the reference method probe. Measure the stack gas temperature at each traverse point (see Section 2.2.1) during the reference method traverse; calculate the average stack gas temperature. Next, determine the moisture percentage, either by: (1) using a psychrometric chart and making appropriate corrections if stack pressure is different from that of the chart, or (2) using saturation vapor pressure tables. In cases where the pyschrometric chart or the saturation vapor pressure tables are not applicable (based on evaluation of the process), alternate methods, subject to the approval of the Administrator, shall be used.

2. *Reference Method*

The procedure described in Method 5 for determining moisture content is acceptable as a reference method.

2.1 Apparatus. A schematic of the sampling train used in this reference method is shown in Figure 4-1. All components shall be maintained and calibrated according to the procedure outlined in Method 5.

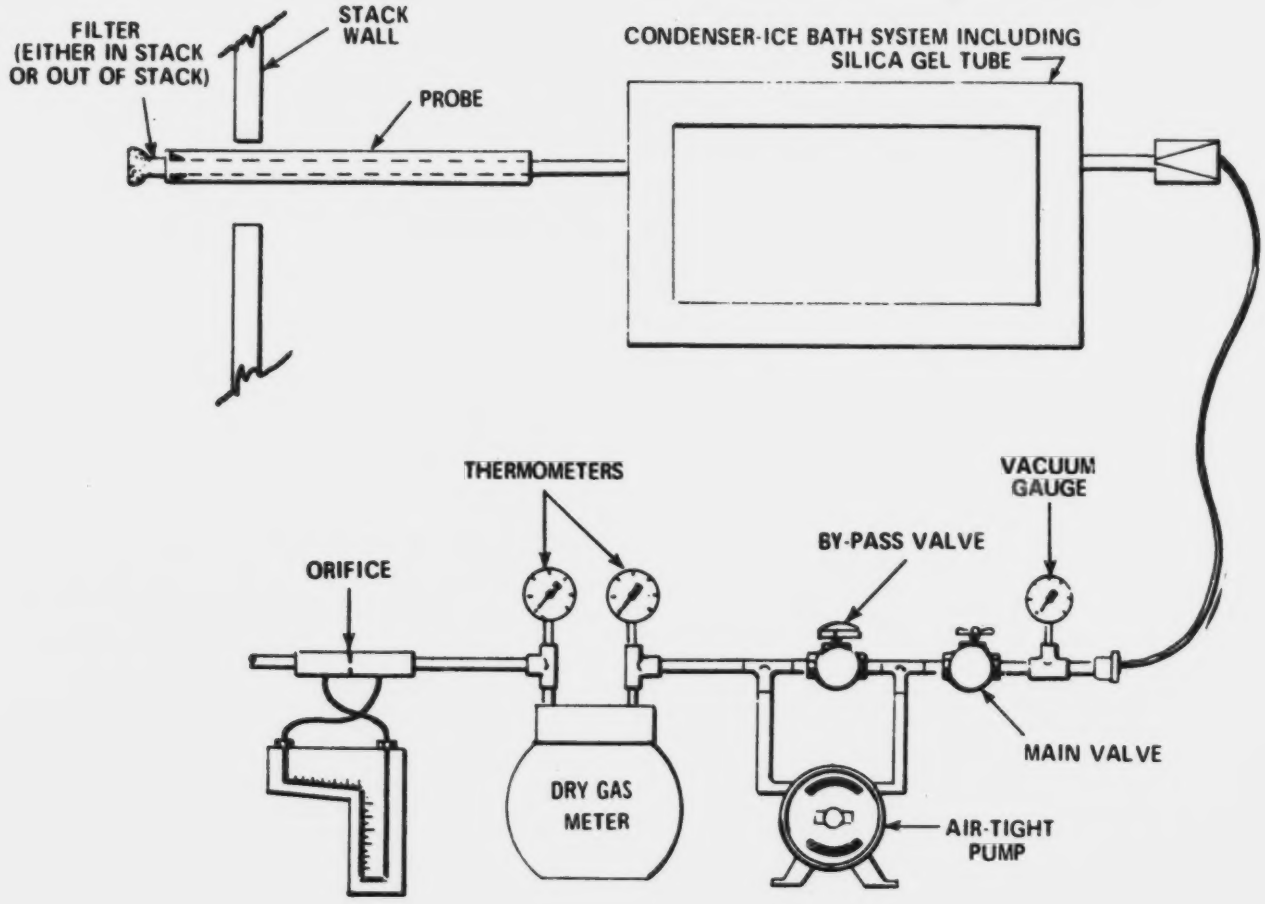

Figure 4-1. Moisture sampling train-reference method.

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2.1.1 Probe. The probe is constructed of stainless steel or glass tubing, sufficiently heated to prevent water condensation, and is equipped with a filter, either in-stack (e.g., a plug of glass wool inserted into the end of the probe) or heated out-stack (e.g., as described in Method 5), to remove particular matter.

When stack conditions permit, other metals or plastic tubing may be used for the probe, subject to the approval of the Administrator.

2.1.2 Condenser. The condenser consists of four impingers connected in series with ground glass, leak-free fittings or any similarly leak-free non-contaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3 centimeter (½ inch) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator.

The first two impingers shall contain known volumes of water, the third shall be empty, and the fourth shall contain a known weight of 6- to 16-mesh indicating type silica gel, or equivalent desiccant. If the silica gel has been previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. A thermometer, capable of measuring temperature to within 1° C (2° F), shall be placed at the outlet of the fourth impinger, for monitoring purposes.

Alternatively, any system may be used (subject to the approval of the Administrator) that cools the sample gas stream and allows measurement of both the water that has been condensed and the moisture leaving the condenser, each to within 1 ml or 1 g. Acceptable means are to measure the condensed water, either gravimetrically or volumetrically, and to measure the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures, or (2) passing the sample gas stream through a tared silica gel (or equivalent desiccant) trap, with exit gases kept below 20° C (68° F), and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump, to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

2.1.3 Cooling System. An ice bath container and crushed ice (or equivalent) are used to aid in condensing moisture.

2.1.4 Metering System. This system includes a vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3° C (5.4° F), dry gas meter capable of measuring volume to within 2 percent, and related equipment as shown in Figure 4–1. Other metering systems, capable of maintaining a constant sampling rate and determining sample gas volume, may be used, subject to the approval of the Administrator.

2.1.5 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg) may be used. In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.6 Graduated Cylinder and/or Balance. These items are used to measure condensed water and moisture caught in the silica gel to within 1 ml or 0.5 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. These balances are suitable for use here.

2.2 Procedure. The following procedure is written for a condenser system (such as the impinger system described in Section 2.1.2) incorporating volumetric analysis to measure the condensed moisture, and silica gel and gravimetric analysis to measure the moisture leaving the condenser.

2.2.1 Unless otherwise specified by the Administrator, a minimum of eight traverse points shall be used for circular stacks having diameters less than 0.61 m (24 in.), a minimum of nine points shall be used for rectangular stacks having equivalent diameters less than 0.61 m (24 in.), and a minimum of twelve traverse points shall be used in all other cases. The traverse points shall be located according to Method 1. The use of fewer points is subject to the approval of the Administrator. Select a suitable probe and probe length such that all traverse points can be sampled. Consider sampling from opposite sides of the stack (four total sampling ports) for large stacks, to permit use of shorter probe lengths. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point. Place known volumes of water in the first two impingers. Weigh and record the

weight of the silica gel to the nearest 0.5 g, and transfer the silica gel to the fourth impinger; alternatively, the silica gel may first be transferred to the impinger, and the weight of the silica gel plus impinger recorded.

2.2.2 Select a total sampling time such that a minimum total gas volume of 0.60 scm (21 scf) will be collected, at a rate no greater than 0.021 m^3/min (0.75 cfm). When both moisture content and pollutant emission rate are to be determined, the moisture determination shall be simultaneous with, and for the same total length of time as, the pollutant emission rate run, unless otherwise specified in an applicable subpart of the standards.

2.2.3 Set up the sampling train as shown in Figure 4-1. Turn on the probe heater and (if applicable) the filter heating system to temperatures of about 120° C (248° F), to prevent water condensation ahead of the condenser; allow time for the temperatures to stabilize. Place crushed ice in the ice bath container. It is recommended, but not required, that a leak check be done, as follows: Disconnect the probe from the first impinger or (if applicable) from the filter holder. Plug the inlet to the first impinger (or filter holder) and pull a 380 mm (15 in.) Hg vacuum; a lower vacuum may be used, provided that it is not exceeded during the test. A leakage rate in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, is unacceptable. Following the leak check, reconnect the probe to the sampling train.

2.2.4 During the sampling run, maintain a sampling rate within 10 percent of constant rate, or as specified by the Administrator. For each run, record the data required on the example data sheet shown in Figure 4-2. Be sure to record the dry gas meter reading at the beginning and end of each sampling time increment and whenever sampling is halted. Take other appropriate readings at each sample point, at least once during each time increment.

2.2.5 To begin sampling, position the probe tip at the first traverse point. Immediately start the pump and adjust the flow to the desired rate. Traverse the cross section, sampling at each traverse point for an equal length of time. Add more ice and, if necessary, salt to maintain a temperature of less 20° C (68° F) at the silica gel outlet.

2.2.6 After collecting the sample, disconnect the probe from the filter holder (or from the first impinger) and conduct a leak check (mandatory) as described in Section 2.2.3. Record the leak rate. If the leakage rate exceeds the allowable rate, the tester shall either reject the test results or shall correct the sample volume as in Section 6.3 of Method 5. Next, measure the volume of the moisture condensed to the nearest ml. Determine the increase in weight of the silica gel (or silica gel plus impinger) to the nearest 0.5 g. Record this information (see example data sheet, Figure 4-3) and calculate the moisture percentage, as described in 2.3 below.

2.3 Calculations. Carry out the following calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

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PLANT _____

LOCATION _____

OPERATOR _____

DATE _____

RUN NO. _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

PROBE LENGTH m(ft) _____

SCHEMATIC OF STACK CROSS SECTION

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STACK TEMPERATURE °C (°F)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), mm(in.) H_2O	METER READING GAS SAMPLE VOLUME m^3 (ft^3)	ΔV_m m^3 (ft^3)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER, °C (°F)
						INLET ($T_{m_{in}}$), °C (°F)	OUTLET ($T_{m_{out}}$), °C (°F)	
TOTAL						Avg.	Avg.	
AVERAGE						Avg.		

Figure 4-2. Field moisture determination-reference method.

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	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
DIFFERENCE		

Figure 4 3. Analytical data - reference method.

2.3.1 Nomenclature.

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg) (m^3)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft^3)/(lb-mole) (°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528°R).

V_M = Dry gas volume measured by dry gas meter, dcm (dcf).

ΔV_m = Incremental dry gas volume measured by dry gas meter at each traverse point, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{wc(std)}$ = Volume of water vapor condensed corrected to standard conditions, scm (scf).

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel corrected to standard conditions, scm (scf).

V_f = Final volume of condenser water, ml.

V_i = Initial volume, if any, of condenser water, ml.

W_f = Final weight of silica gel or silica gel plus impinger, g.

W_i = Initial weight of silica gel or silica gel plus impinger, g.

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

2.3.2 Volume of water vapor condensed.

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w RT_{std}}{P_{std}M_w} = K_1(V_f - V_i)$$

Equation 4-1

where:

K_1 = 0.001333 m^3/ml for metric units
= 0.04707 ft^3/ml for English units

2.3.3 Volume of water vapor collected in silica gel.

$$V_{wsg(std)} = \frac{(W_f - W_i)RT_{std}}{P_{std}M_w} = K_2(W_f - W_i)$$

Equation 4-2

where:

K_2 = 0.001335 m^3/g for metric units
= 0.04715 ft^3/g for English units

2.3.4 Sample gas volume.

$$V_{m(std)} = V_m Y \frac{(P_m)(T_{std})}{(P_{std})(T_m)} = K_3 Y \frac{V_m P_m}{T_m}$$

Equation 4-3

where:

K_3 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: If the post-test lead rate (Section 2.2.6) exceeds the allowable rate, correct the value of V_m in Equation 4-3, as described in Section 6.3 of Method 5.

2.3.5 Moisture Content.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Equation 4-4

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NOTE: In saturated or moisture droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one using a value based upon the saturated conditions (see Section 1.2), and another based upon the results of the impinger analysis. The lower of these two values of B_{ws} shall be considered correct.

2.3.6 Verification of constant sampling rate. For each time increment, determine the ΔV_m. Calculate the average. If the value for any time increment differs from the average by more than 10 percent, reject the results and repeat the run.

3. *Approximation Method*

The approximation method described below is presented only as a suggested method (see Section 1.2).

3.1 Apparatus.

3.1.1 Probe. Stainless steel glass tubing, sufficiently heated to prevent water condensation and equipped with a filter (either in-stack or heated out-stack) to remove particulate matter. A plug of glass wool, inserted into the end of the probe, is a satisfactory filter.

3.1.2 Impingers. Two midget impingers, each with 30 ml capacity, or equivalent.

3.1.3 Ice Bath. Container and ice, to aid in condensing moisture in impingers.

3.1.4 Drying Tube. Tube packed with new or regenerated 6- to 16-mesh indicating-type silica gel (or equivalent desiccant), to dry the sample gas and to protect the meter and pump.

3.1.5 Valve. Needle valve, to regulate the sample gas flow rate.

3.1.6 Pump. Leak-free, diaphragm type, or equivalent, to pull the gas sample through the train.

3.1.7 Volume Meter. Dry gas meter, sufficiently accurate to measure the sample volume within 2%, and calibrated over the range of flow rates and conditions actually encountered during sampling.

3.1.8 Rate Meter. Rotameter, to measure the flow range from 0 to 3 lpm (0 to 0.11 cfm).

3.1.9 Graduated Cylinder. 25 ml.

3.1.10 Barometer. Mercury, aneroid, or other barometer, as described in Section 2.1.5 above.

3.1.11 Vacuum Gauge. At least 760 mm Hg (30 in. Hg) gauge, to be used for the sampling leak check.

3.2 Procedure.

3.2.1 Place exactly 5 ml distilled water in each impinger.

Leak check the sampling train as follows: Temporarily insert a vacuum gauge at or near the probe inlet; then, plug the probe inlet and pull a vacuum of at least 250 mm Hg (10 in. Hg). Note, the time rate of change of the dry gas meter dial; alternatively, a rotameter (0-40 cc/min) may be temporarily attached to the dry gas meter outlet to determine the leakage rate. A leak rate not in excess of 2 percent of the average sampling rate is acceptable.

NOTE: Carefully release the probe inlet plug before turning off the pump.

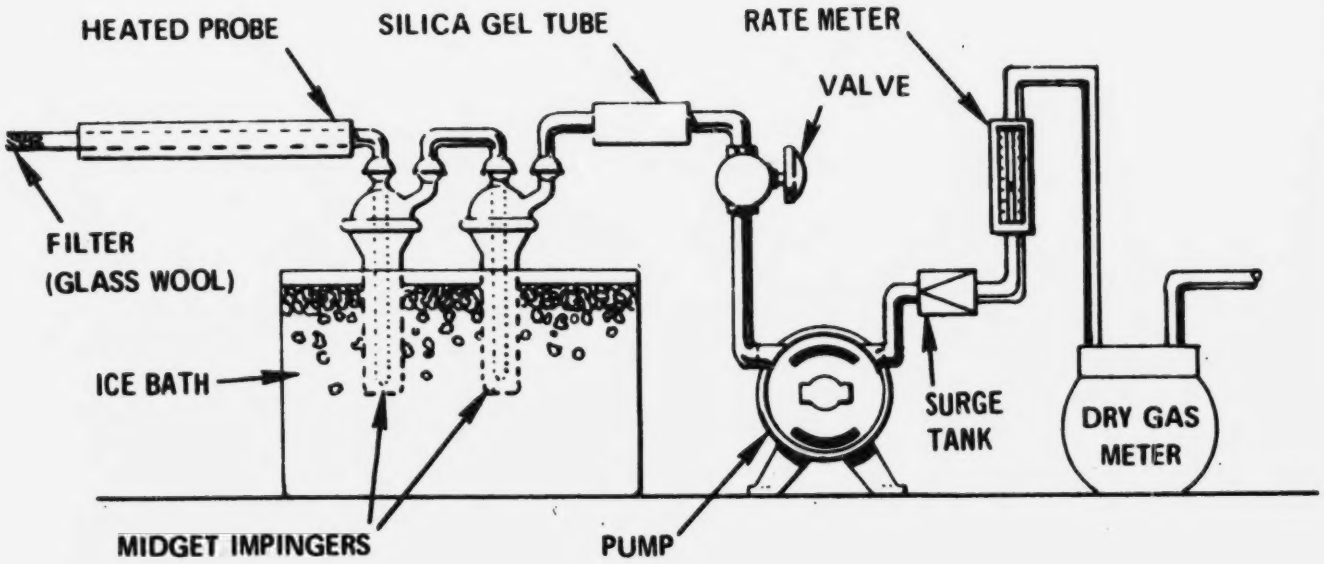

Figure 4-4. Moisture-sampling train - approximation method.

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LOCATION _____ COMMENTS

TEST _____

DATE _____

OPERATOR _____

BAROMETRIC PRESSURE _____

CLOCK TIME	GAS VOLUME THROUGH METER, (Vm), m^3 (ft^3)	RATE METER SETTING m^3/min. (ft^3/min.)	METER TEMPERATURE, °C (°F)

Figure 4-5. Field moisture determination - approximation method.

3.2.2 Connect the probe, insert it into the stack, and sample at a constant rate of 2 lpm (0.071 cfm). Continue sampling until the dry gas meter registers about 30 liters (1.1 ft³) or until visible liquid droplets are carried over from the first impinger to the second. Record temperature, pressure, and dry gas meter readings as required by Figure 4-5.

3.2.3 After collecting the sample, combine the contents of the two impingers and measure the volume to the nearest 0.5 ml.

3.3 Calculations. The calculation method presented is designed to estimate the moisture in the stack gas; therefore, other data, which are only necessary for accurate moisture determinations, are not collected. The following equations adequately estimate the moisture content, for the purpose of determining isokinetic sampling rate settings.

3.3.1 Nomenclature.

B_{wm} = Approximate proportion, by volume, of water vapor in the gas stream leaving the second impinger, 0.025.

B_{ws} = Water vapor in the gas stream, proportion by volume.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter.

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg) (m³)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft³)/lb-mole) (°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528° R).

V_f = Final volume of impinger contents, ml.

V_i = Initial volume of impinger contents, ml.

V_m = Dry gas volume measured by dry gas meter, dcm (def).

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{wc(std)}$ = Volume of water vapor condensed, corrected to standard conditions, scm (scf).

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

Y = Dry gas meter calibration factor.

3.3.2 Volume of water vapor collected.

where:

$$V_{wc} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w} = K_1 (V_f - V_i)$$

Equation 4-5

$K_1 = 0.001333$ m³/ml for metric units
$= 0.04707$ ft³/ml for English units.

3.3.3 Gas volume.

$$V_{m(std)} = V_m \left(\frac{P_m}{P_{std}}\right)\left(\frac{T_{std}}{T_m}\right) = K_2 \frac{V_m P_m}{T_m}$$

Equation 4-6

where:

$K_2 = 0.3858$ °K/mm Hg for metric units
$= 17.64$ °R/in. Hg for English units

3.3.4 Approximate moisture content.

$$B_{ws} = \frac{V_{wc}}{V_{wc} + V_{m(std)}} + B_{wm} = \frac{V_{wc}}{V_{wc} + V_{m(std)}} + (0.025)$$

Equation 4-7

4. *Calibration*

4.1 For the reference method, calibrate equipment as specified in the following sections of Method 5: Section 5.3 (metering system); Section 5.5 (temperature gauges); and Section 5.7 (barometer). The recommended leak check of the metering system (Section 5.6 of Method 5) also applies to the reference method. For the approximation method, use the procedures outlined in Section 5.1.1 of Method 6 to calibrate the metering system, and the procedure of Method 5, Section 5.7 to calibrate the barometer.

5. *Bibliography*

1. Air Pollution Engineering Manual (Second Edition). Danielson, J. A. (ed.). U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, N.C. Publication No. AP-40. 1973.

2. Devorkin, Howard. et al. Air Pollution Source Testing Manual. Air Pollution Control District, Los Angeles, Calif. November, 1963.

3. Methods for Determination of Velocity, Volume Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co., Los Angeles, Calif. Bulletin WP-50. 1968.

Method 5—Determination of Particulate Emissions From Stationary Sources

1. *Principle and Applicability*

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1.1 Principle. Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120±14° C (248±25° F) or such other temperature as specified by an applicable subpart of the standards or approved by Administrator, U.S. Environmental Protection Agency, for a particular application. The particulate mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of particulate emissions from stationary sources.

2. *Apparatus*

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in Section 7); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in Section 7). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

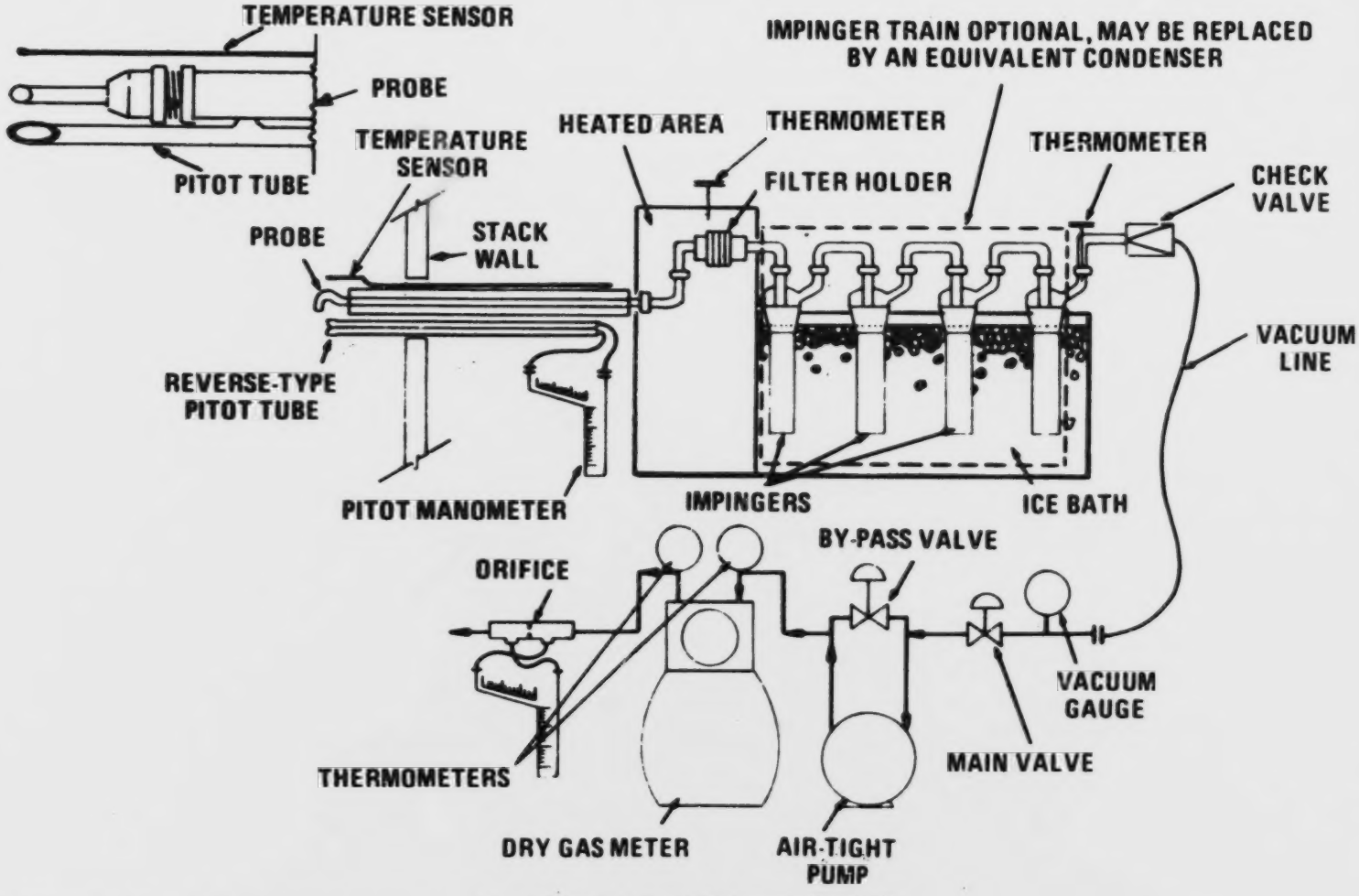

Figure 5-1. Particulate-sampling train.

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2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be 30° and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (⅛ to ½ in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

2.1.2 Probe Liner. Borosilicate or quartz glass tubing with a heating system capable of maintaining a gas temperature at the exit end during sampling of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. (The tester may opt to operate the equipment at a temperature lower than that specified.) Since the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) will be considered acceptable.

Either borosilicate or quartz glass probe liners may be used for stack temperatures up to about 480° C (900° F) quartz liners shall be used for temperatures between 480 and 900° C (900 and 1,650° F). Both types of liners may be used at higher temperatures than specified for short periods of time, subject to the approval of the Administrator. The softening temperature for borosilicate is 820° C (1,508° F), and for quartz it is 1,500° C (2,732° F).

Whenever practical, every effort should be made to use borosilicate or quartz glass probe liners. Alternatively, metal liners (e.g., 316 stainless steel, Incoloy 825,[2] or other corrosion resistant metals) made of seamless tubing may be used, subject to the approval of the Administrator.

2.1.3 Pitot Tube. Type S, as described in Section 2.1 of Method 2, or other device approved by the Administrator. The pitot tube shall be attached to the probe (as shown in Figure 5-1) to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of Method 2.

2.1.4 Differentia Pressure Gauge. Inclined manometer or equivalent device (two), as described in Section 2.2 of Method 2. One manometer shall be used or velocity head ($\Delta\rho$) readings, and the other, for orifice differentia pressure readings.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other materials of construction (e.g., stainless steel, Teflon, Viton) may be used, subject to approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe (or cyclone, it used).

2.1.6 Filter Heating System. Any heating system capable of maintaining a temperature around the filter holder during sampling of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. Alternatively, the tester may opt to operate the equipment at a temperature lower than that specified. A temperature gauge capable of measuring temperature to within 3° C (5.4° F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

2.1.7 Condenser. The following system shall be used to determine the stack gas moisture content: Four impingers connected in series with leak-free ground glass fittings or any similar leak-free non-contaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with 1.3 cm (½ in.) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator. The first and second impingers shall contain known quantities of water (Section 4.1.3), the third shall be empty, and the fourth shall contain a known weight of silica gel, or equivalent desiccant. A thermometer, capable of measuring temperture to within 1° C (2° F) shall be placed at the outlet of the fourth impinger for monitoring purposes.

Alternatively, any system that cools the sample gas stream and allows measurement of the water condensed and moisture leav-

[2]Mention of trade names or specific product does not constitute endorsement by the Environmental Protection Agency.

ing the condenser, each to within 1 ml or 1 g may be used, subject to the approval of the Administrator. Acceptable means are to measure the condensed water either gravimetrically or volumetrically and to measure the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures; or (2) passing the sample has stream through a tared silica gel (or equivalent desiccant) trap with exit gases kept below 20° C (68° F) and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

NOTE: If a determination of the particulate matter collected in the impingers is desired in addition to moisture content, the impinger system described above shall be used, without modification. Individual States or control agencies requiring this information shall be contacted as to the sample recovery and analysis of the impinger contents.

2.1.8 Metering System. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3° C (5.4° F), dry gas meter capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 5-1. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall enable checks of isokinetic rates.

Sampling trains utilizing metering systems designed for higher flow rates than that decribed in APTD-0581 or APDT-0576 may be used provided that the specifications of this method are met.

2.1.9 Barometer. Mercury aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.10 Gas Density Determination Equipment. Temperature sensor and pressure gauge, as described in Sections 2.3 and 2.4 of Method 2, and gas analyzer, if necessary, as described in Method 3. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see Method 2, Figure 2-7). As a second alternative, if a difference of not more than 1 percent in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube. (This alternative is subject to the approval of the Administrator.)

2.2 Sample Recovery. The following items are needed.

2.2.1 Probe-Liner and Probe-Nozzle Brushes. Nylon bristle brushes with stainless steel wire handles. The probe brush shall have extensions (at least as long as the probe) of stainless steel, Nylon, Teflon, or similarly inert material. The brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

2.2.2 Wash Bottles—Two. Glass wash bottles are recommended; polyethylene wash bottles may be used at the option of the tester. It is recommended that acetone not be stored in polyethylene bottles for longer than a month.

2.2.3 Glass Sample Storage Containers. Chemically resistant, borosilicate glass bottles, for acetone washes, 500 ml or 1000 ml. Screw cap liners shall either be rubber-backed Teflon or shall be constructed so as to be leak-free and resistant to chemical attack by acetone. (Narrow mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

2.2.4 Petri Dishes. For filter samples, glass or polyethylene, unless otherwise specified by the Administrator.

2.2.5 Graduated Cylinder and/or Balance. To measure condensed water to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. Any of these balances is suitable or use here and in Section 2.3.4.

2.2.6 Plastic Storage Containers. Airtight containers to store silica gel.

2.2.7 Funnel and Rubber Policeman. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

2.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

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2.2 Analysis. For analysis, the following equipment is needed.

2.3.1 Glass Weighing Dishes.

2.3.2 Desiccator.

2.3.3 Analytical Balance. To measure to within 0.1 mg.

2.3.4 Balance. To measure to within 0.5 g.

2.3.5 Beakers. 250 ml.

2.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

2.3.7 Temperature Gauge. To measure the temperature of the laboratory environment.

3. *Reagents*

3.1 Sampling. The reagents used in sampling are as follows:

3.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3-micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D 2986-71. Test data from the supplier's quality control program are sufficient for this purpose. In sources containing SO_2 or SO_3, the filter material must be of a type that is unreactive to SO_2 or SO_3. Citation 10 in Section 7 may be used to select the appropriate filter.

3.1.2 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.3 Water. When analysis of the material caught in the impingers is required, distilled water shall be used. Run blanks prior to field use to eliminate a high blank on test samples.

3.1.4 Crushed Ice.

3.1.5 Stopcock Grease. Acetone-insoluble, heat-stable silicone grease. This is not necessary if screw-on connectors with Teflon sleeves, or similar, are used. Alternatively, other types of stopcock grease may be used, subject to the approval of the Administrator.

3.2 Sample Recovery. Acetone-reagent grade, <0.001 percent residue, in glass bottles—is required. Acetone from metal containers generally has a high residue blank and should not be used. Sometimes, suppliers transfer acetone to glass bottles from metal containers; thus, acetone blanks shall be run prior to field use and only acetone with low blank values (<0.001 percent) shall be used. In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight.

3.3 Analysis. Two reagents are required for the analysis:

3.3.1 Acetone. Same as 3.2.

3.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

4. *Procedure*

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation. All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified herein.

Weigh several 200 to 300 g portions of silica gel in air-tight containers to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel need not be preweighed, but may be weighed directly in the impinger or sampling holder just prior to train assembly.

Check filters visually against light for irregularities and flaws or pinhole leaks. Label filters of the proper diameter on the back side near the edge using numbering machine ink. As an alternative, label the shipping containers (glass or plastic petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

Desiccate the filters at 20±5.6° C (68±10° F) and ambient pressure for at least 24 hours and weigh at intervals of at least 6 hours to a constant weight, i.e., 0.5 mg change from previous weighing; record results to the nearest 0.1 mg. During each weighing the filter must not be exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50 percent. Alternatively (unless otherwise specified by the Administrator), the filters may be oven dried at 105° C (220° F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

4.1.2 Preliminary Determinations. Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2; it is recommended that a leak-check of the pitot lines (see Method 2, Section 3.1) be performed. Determine the moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in Method 2, Section 3.6; if integrated Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for

the same total length of time as, the particulate sample run.

Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differental pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of Method 2).

Select a suitable probe liner and probe length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the length of probes.

Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that (1) the sampling time per point is not less than 2 min (or some greater time interval as specified by the Administrator), and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

It is recommended that the number of minutes sampled at each point be an integer or an integer plus one-half minute, in order to avoid timekeeping errors. The sampling time at each point shall be the same.

In some cirumstances, e.g., batch cycles, it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

4.1.3 Preparation of Collection Train. During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Place 100 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is property centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

When glass liners are used, install the selected nozzle using a Viton A O-ring when stack temperatures are less than 260° C (500° F) and an asbestos string gasket when temperatures are higher. See APTD-0576 for details. Other connecting systems using either 316 stainless steel or Teflon ferrules may be used. When metal liners are used, install the nozzle as above or by a leak-free direct mechanical connection. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Set up the train as in Figure 5-1, using (if necessary) a very light coat of silicone grease on all ground glass joints, greasing only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack gas.

Place crushed ice around the impingers.

4.1.4 Leak-Check Procedures.

4.1.4.1 Pretest Leak-Check. A pretest leak-check is recommended, but not required. If the tester opts to conduct the pretest leak-check, the following procedure shall be used.

After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm Hg (15 in. Hg) vacuum.

NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.

If an asbestos string is used, do not connect the probe to the train during the leak-check. Instead, leak-check the train by first plugging the inlet to the filter holder (cycone, if applicable) and pulling a 380 mm Hg (15 in. Hg) vacuum (see Note immediately above). Then connect the probe to the train and leak-check at about 25 mm Hg (1 in. Hg) vacuum; alternatively, the probe may be leak-checked with the rest of the sampling train, in one step, at 380 mm Hg (15 in. Hg) vacuum. Leakage rates in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable.

The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with bypass valve fully open and coarse adjust valve, completely closed. Partially open the coarse adjust valve and slowly close the bypass valve until the desired vacuum is reached. Do not reverse direction of bypass value; this will cause water

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to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check as shown below and start over.

When the leak-check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable) and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and silica get from being entrained backward into the third impinger.

4.1.4.2 Leak-Checks During Sample Run. If, during the sampling run, a component (e.g., filter assembly or impinger) change becomes unecessary, a leak-check shall be conducted immediately before the change is made. The leak-check shall be done according to the procedure outlined in Section 4.1.4.1 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered; if, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and plan to correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

Immediately after component changes, leak-checks are optional; if such leak-checks are done, the procedure outlined in Section 4.1.4.1 above shall be used.

4.1.4.3 Post-test Leak-Check. A leak-check is mandatory at the conclusion of each sampling run. The leakcheck shall be done in accordance with the procedures outlined in Section 4.1.4.1, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

4.1.5 Particulate Train Operation. During the sampling run, maintain an isokinetic sampling rate (within 10 percent of true isokinetic unless otherwise specified by the Administrator) and a temperature around the filter of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator.

For each run, record the data required on a data sheet such as the one shown in Figure 5-2. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak-check, and when sampling is halted. Take other readings required by Figure 5-2 at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

Clean the portholes prior to the test run to minimize the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are up to temperature, and that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient is 0.85±0.02, and the stack gas equivalent density (dry molecular weight) is equal to 29±4. APTD-0576 details the procedure for using the nomographs. If C_p and M_d are outside the above stated ranges do not use the nomographs unless appropriate steps (see Citation 7 in Section 7) are taken to compensate for the deviations.

PLANT _____

LOCATION _____

OPERATOR _____

DATE _____

RUN NO. _____

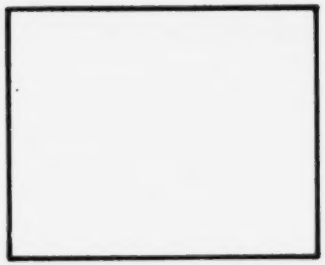
SAMPLE BOX NO. _____

METER BOX NO. _____

METER $\Delta H_@$ _____

C FACTOR _____

PITOT TUBE COEFFICIENT, C_p _____



SCHEMATIC OF STACK CROSS SECTION

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, m (ft) _____

NOZZLE IDENTIFICATION NO. _____

AVERAGE CALIBRATED NOZZLE DIAMETER, cm (in.) _____

PROBE HEATER SETTING _____

LEAK RATE, m^3/min. (cfm) _____

PROBE LINER MATERIAL _____

STATIC PRESSURE, mm Hg (in. Hg) _____

FILTER NO. _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	VACUUM mm Hg (in. Hg)	STACK TEMPERATURE (T_s) °C (°F)	VELOCITY HEAD (ΔP_s), mm(in.)H_2O	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER mm H_2O (in. H_2O)	GAS SAMPLE VOLUME m^3 (ft^3)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		FILTER HOLDER TEMPERATURE, °C (°F)	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER, °C (°F)
							INLET °C (°F)	OUTLET °C (°F)		
TOTAL							Avg.	Avg.		
AVERAGE							Avg.			

Figure 5-2. Particulate field data.

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When the stack is under significant negative pressure (height of impinger stem), take care to close the coarse adjust valve before inserting the probe into the stack to prevent water from backing into the filter holder. If necessary, the pump may be turned on with the coarse adjust valve closed.

When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

Traverse the stack cross-section, as required by Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the portholes; this minimizes the chance of extracting deposited material.

During the test run, make periodic adjustments to keep the temperature around the filter holder at the proper level; add more ice and, if necessary, salt to maintain a temperature of less than 20° C (68° F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced in the midst of a sample run. It is recommended that another complete filter assembly be used rather than attempting to change the filter itself. Before a new filter assembly is installed, conduct a leak-check (see Section 4.1.4.2). The total particulate weight shall include the summation of all filter assembly catches.

A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or, in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

Note that when two or more trains are used, separate analyses of the front-half and (if applicable) impinger catches from each train shall be performed, unless identical nozzle sizes were used on all trains, in which case, the front-half catches from the individual trains may be combined (as may the impinger catches) and one analysis of front-half catch and one analysis of impinger catch may be performed. Consult with the Administrator for details concerning the calculation of results when two or more trains are used.

At the end of the sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak-check, as outlined in Section 4.1.4.3. Also, leak-check the pitot lines as described in Method 2, Section 3.1; the lines must pass this leak-check, in order to validate the velocity head data.

4.1.6 Calculation of Percent Isokinetic. Calculate percent isokinetic (see Calculations, Section 6) to determine whether the run was valid or another test run should be made. If there was difficulty in maintaining isokinetic rates due to source conditions, consult with the Administrator for possible variance on the isokinetic rates.

4.2 Sample Recovery. Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over it to prevent losing or gaining particulate matter. Do not cap off the probe tip tightly while the sampling train is cooling down as this would create a vacuum in the filter holder, thus drawing water from the impingers into the filter holder.

Before moving the sample train to the cleanup site, remove the probe from the sample train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the filter inlet where the probe was fastened and cap it. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger or condenser and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the impingers or condenser. After wiping off the silicone grease, cap off the filter holder outlet and impinger inlet. Either ground-glass stoppers, plastic caps, or serum caps may be used to close these openings.

Transfer the probe and filter-impinger assembly to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

Save a portion of the acetone used for cleanup as a blank. Take 200 ml of this acetone directly from the wash bottle being used and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Carefully transfer to the petri dish any particulate matter and/or filter fibers which adhere to the filter holder gasket, by using a dry Nylon

bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank and follow the Administrator's directions on analysis. Perform the acetone rinses as follows:

Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid on transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter which is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people be used to clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contaminations.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid levcel to determine whether or not leakage occured during transport. Label the container to clearly identify its contents.

Container No. 3. Note the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. it is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows; Make a notation of any color or film in the liquid catch. Measure the liquid which is in the first three impingers to within ± 1 ml by using a graduated cylinder or by weighing it to within ± 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see Note, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

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Plant _____

Date _____

Run No. _____

Filter No. _____

Amount liquid lost during transport _____

Acetone blank volume, ml _____

Acetone wash volume, ml _____

Acetone blank concentration, mg/mg (equation 5-4) _____

Acetone wash blank, mg (equation 5-5) _____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED, mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
TOTAL			
		Less acetone blank	
		Weight of particulate matter	

	VOLUME OF LIQUID WATER COLLECTED		
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g	
FINAL			
INITIAL			
LIQUID COLLECTED			
TOTAL VOLUME COLLECTED		g*	ml

* CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING TOTAL WEIGHT INCREASE BY DENSITY OF WATER (1g/ml).

$$\frac{\text{INCREASE, g}}{\text{1 g/ml}} = \text{VOLUME WATER, ml}$$

Figure 5-3. Analytical data.

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose particulate from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105° C (220° F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105° C (220° F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure acetone in this container either volumentrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

5. *Calibration*

Maintain a laboratory log of all calibrations.

5.1 Probe Nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 01.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

5.2 Pitot Tube. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of Method 2.

5.3 Metering System. Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry gas meter dial readings to correspond to the wet test meter readings, calibration factors may be used to mathematically correct the gas meter dial readings to the proper values. Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. for these cases the following leak-check procedure is suggested: make a 10-minute calibration run at 0.0057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet test meter and dry gas meter volumes; divide the difference by 10, to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test). With the vacuum set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

Alternative procedures, e.g., using the orifice meter coefficients, maybe used, subject to the approval of the Administrator.

NOTE: If the dry gas meter coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

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5.4 Probe Heater Calibration. The probe heating system shall be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

5.5 Temperature Gauges. Use the procedure in Section 4.3 of Method 2 to calibrate in-stack temperature gauges. Dial thermometers, such as are used for the dry gas meter and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

5.6 Leak Check of Metering System Shown in Figure 5-1. That portion of the sampling train from the pump to the orifice meter should be leak checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 5-4): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing atached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 18 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for one minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

5.7 Barometer. Calibrate against a mercury barometer.

6. *Calculations*

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

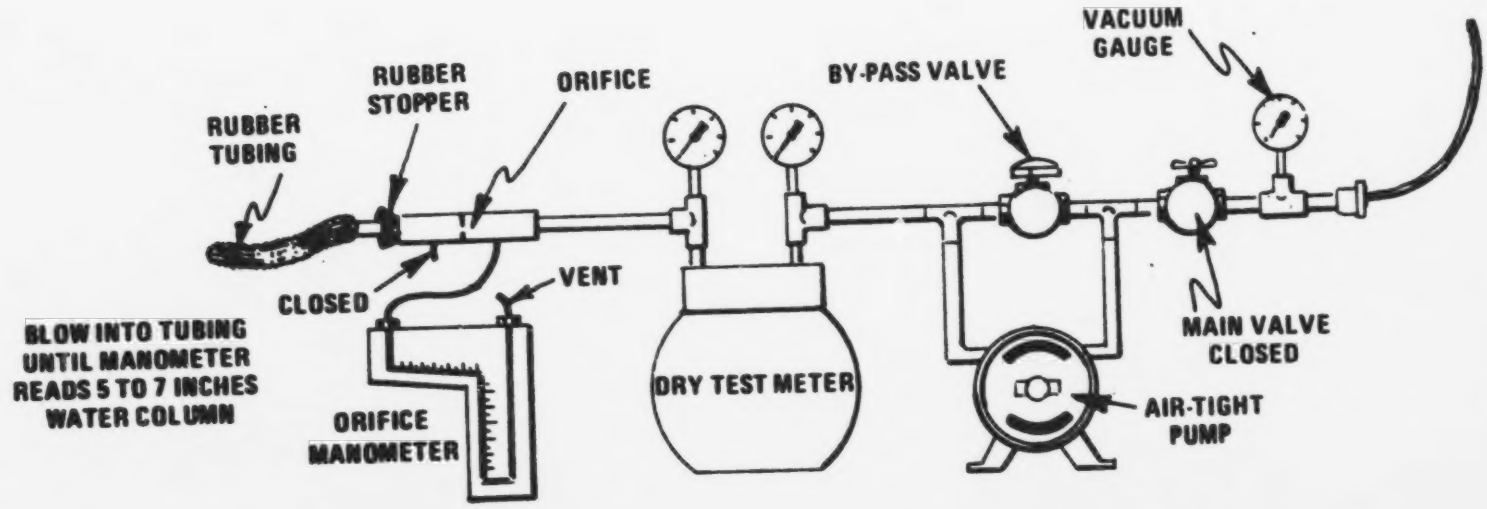

Figure 5–4. Leak check of meter box.

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6.1 Nomenclature

A_n = Cross-sectional area of nozzle, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream, proportion by volume.
C_a = Acetone blank residue concentration, mg/g.
c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
I = Percent of isokinetic sampling.
L_a = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.0057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (i=1, 2, 3....n), m^3/min (cfm).
L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).
m_a = Total amount of particulate matter collected, mg.
M_w = Molecular weight of water, 18.0 g/g-mole (18.0lb/lb-mole).
m_a = Mass of residue of acteone after evaporation, mg.
P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
R = Ideal gas constant, 0.06236 mm Hg-m^3/°K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).
T_m = Absolute average dry gas meter temperature (see Figure 5-2), °K (°R).
T_s = Absolute average stack gas temperature (see Figure 5-2), °K (°R).
T_{std} = Standard absolute temperature, 293° K (528° R).
V_a = Volume of acetone blank, ml.
V_{aw} = Volume of acetone used in wash, ml.
V_{lc} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3), ml.
V_m = Volume of gas sample as measured by dry gas meter, dcm (dscf).
$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
v_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).
W_a = Weight of residue in acetone wash, mg.
Y = Dry gas meter calibration factor.
ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H_2O (in. H_2O).
ρ_a = Density of acetone, mg/ml (see label on bottle).
ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).
θ = Total sampling time, min.
θ_1 = Sampling time interval, from the beginning of a run until the first component change, min.
θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.
θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.
13.6 = Specific gravity of mercury.
60 = Sec/min.
100 = Conversion to percent.

6.2 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 5-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C, 760 mm Hg or 68° F, 29.92 in. Hg) by using Equation 5-1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right]$$

$$= K_1 V_m Y \frac{P_{bar} + (\Delta H/13.6)}{T_m}$$

Equation 5-1

where;
K_1 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: Equation 5-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 5-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 5-1 with the expression:

$$V_m - (L_p - L_a)\theta]$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 5-1 by the expression:

$$\left[V_m - (L_1 - L_a)\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_i - (L_p - L_a)\theta_p\right]$$

and substitute only for those leakage rates (L_a or L_p) which exceed L_a.

6.4 Volume of water vapor.

$$V_{w(std)} = V_{lc}\left(\frac{\rho_w}{M_w}\right)\left(\frac{RT_{std}}{P_{std}}\right) = K_2 V_{lc} \qquad \text{Equation 5-2}$$

where:

$K_2 = 0.001333$ m³/ml for metric units
$= 0.04707$ ft³/ml for English units.

6.5 Moisture Content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}}$$

Equation 5-3

NOTE: In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 5-3), and a second from the assumption of saturated conditions. The lower of the two values of B_w shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in the Note of Section 1.2 of Method 4. For the purposes of this method, the average stack gas temperature from Figure 5-2 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1° C (2° F).

6.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \qquad \text{Equation 5-4}$$

6.7 Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a \qquad \text{Equation 5-5}$$

6.8 Total Particulate Weight. Determine the total particulate catch from the sum of the weights obtained from containers 1 and 2 less the acetone blank (see Figure 5-3).

NOTE: Refer to Section 4.1.5 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

6.9 Particulate Concentration.

$$c_s = (0.001\ g/mg)\ (m_n / V_{m(std)}) \qquad \text{Equation 5-6}$$

6.10 Conversion Factors:

From	To	Multiply by
scf	m³	0.02832.
g/ft³	gr/ft³	15.43.
g/ft³	lb/ft³	2.205×10^{-3}.
g/ft³	g/m³	35.31.

6.11 Isokinetic Varition.

6.11.1 Calculation From Raw Data.

$$I = \frac{100\, T_s [K_3 V_{lc} + (V_m / T_m)\,(P_{bar} + \Delta H/13.6)]}{60\, \theta v_s P_s A_n} \qquad \text{Equation 5-7}$$

where:

$K_3 = 0.003454$ mm Hg–m³/ml–°K for metric units.
$= 0.002669$-in. Hg–ft³/ml–°R for English units.

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6.11.2 Calculation From Intermediate Values.

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} v_s \theta A_n P_s 60(1-B_{ws})}$$

$$= K_4 \frac{T_s V_{m(std)}}{P_s V_s A_n \theta (1-B_{ws})}$$

Equation 5-8

where:
K_4=4.320 for metric units
=0.09450 for English units.

6.12 Acceptable Results. If 90 percent I <110< percent, the results are acceptable. If the results are low in comparison to the standard and I is beyond the acceptable range, or, if I is less than 90 percent, the Administrator may opt to accept the results. Use Citation 4 to make judgments. Otherwise, reject the results and repeat the test.

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Method 6—Determination of Sulfur Dioxide Emissions From Stationary Sources

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted from the sampling point in the stack. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated. The sulfur dioxide fraction is measured by the barium-thorin titration method.

1.2 Applicability. This method is applicable for the determination of sulfur dioxide emissions from stationary sources. The minimum detectable limit of the method has been determined to be 3.4 milligrams (mg) of SO_2/m^3 (2.12×10^{-7} lb/ft^3). Although no upper limit has been established, tests have shown that concentrations as high as 80,000 mg/m^3 of SO_2 can be collected efficiently in two midget impingers, each containing 15 milliliters of 3 percent hydrogen peroxide, at a rate of 1.0 lpm for 20 minutes. Based on theoretical calculations, the upper concentration limit in a 20-liter sample is about 93,300 mg/m$_3$.

Possible interferents are free ammonia, water-soluble cations, and fluorides. The cations and fluorides are removed by glass wool filters and an isopropanol bubbler, and hence do not affect the SO_2 analysis. When samples are being taken from a gas stream with high concentrations of very find metallic fumes (such as in inlets to control devices), a high-efficiency glass fiber filter must be used in place of the glass wool plug (i.e., the one in the probe) to remove the cation interferents.

Free ammonia interferes by reacting with SO_2 to form particulate sulfite and by reacting with the indicator. If free ammonia is present (this can be determined by knowledge of the process and noticing white particulate matter in the probe and isopropanol bubbler), alternative methods, subject to the approval of the Administrator, U.S. Environmental Protection Agency, are required.

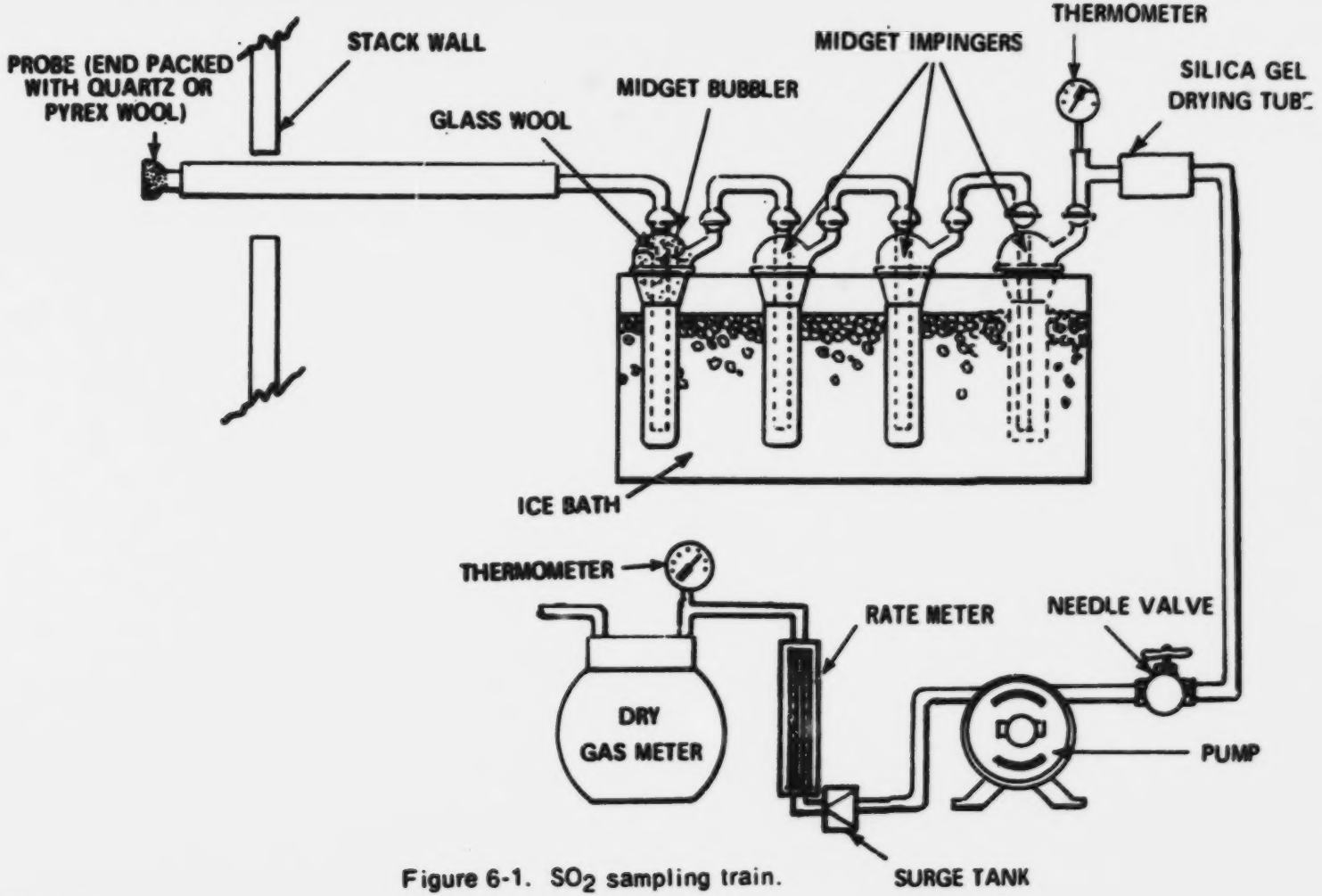

Figure 6-1. SO_2 sampling train.

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2. *Apparatus*

2.1 Sampling. The sampling train is shown in Figure 6-1, and component parts are discussed below. The tester has the option of substituting sampling equipment described in Method 8 in place of the midget impinger equipment of Method 6. However, the Method 8 train must be modified to include a heated filter between the probe and isopropanol impinger, and the operation of the sampling train and sample analysis must be at the flow rates and solution volumes defined in Method 8.

The tester also has the option of determining SO_3 simultaneously with particulate matter and moisture determinations by (1) replacing the water in a Method 5 impinger system with 3 percent peroxide solution, or (2) by replacing the Method 5 water impinger system with a Method 8 isopropanol-filter-peroxide system. The analysis for SO_3 must be consistent with the procedure in Method 8.

2.1.1 Probe. Borosilicate glass, or stainless steel (other materials of construction may be used, subject to the approval of the Administrator), approximately 6-mm inside diameter, with a heating system to prevent water condensation and a filter (either in-stack or heated outstack) to remove particulate matter, including sulfuric acid mist. A plug of glass wool is a satisfactory filter.

2.1.2 Bubbler and Impingers. One midget bubbler, with medium-coarse glass frit and borosilicate or quartz glass wool packed in top (see Figure 6-1) to prevent sulfuric acid mist carryover, and three 30-ml midget impingers. The bubbler and midget impingers must be connected in series with leak-free glass connectors. silicone grease may be used, if necessary, to prevent leakage.

At the option of the tester, a midget impinger may be used in place of the midget bubbler.

Other collection absorbers and flow rates may be used, but are subject to the approval of the Administrator. Also, collection efficiency must be shown to be at least 99 percent for each test run and must be documented in the report. If the efficiency is found to be acceptable after a series of three tests, further documentation is not required. To conduct the efficiency test, an extra absorber must be added and analyzed separately. This extra absorber must not contain more than 1 percent of the total SO_3.

2.1.3 Glass Wool. Borosilicate or quartz.

2.1.4 Stopcock Grease. Acetone-insoluble, heatstable silicone grease may be used, if necessary.

2.1.5 Temperature Gauge. Dial thermometer, or equivalent, to measure temperature of gas leaving impinger train to within 1° C (2° F.)

2.1.6 Drying Tube. Tube packed with 6- to 16-mesh indicating type silica gel, or equivalent, to dry the gas sample and to protect the meter and pump. If the silica gel has been used previously, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of decissants (equivalent or better) may be used, subject to approval of the Administrator.

2.1.7 Valve. Needle valve, to regulate sample gas flow rate.

2.1.8 Pump. Leak-free diaphragm pump, or equivalent, to pull gas through the train. Install a small surge tank between the pump and rate meter to eliminate the pulsation effect of the diaphragm pump on the rotameter.

2.1.9. Rate Meter. Rotameter, or equivalent, capable of measuring flow rate to within 2 percent of the selected flow rate of about 1000 cc/min.

2.1.10 Volume Meter. Dry gas meter, sufficiently accurate to measure the sample volume within 2 percent, calibrated at the selected flow rate and conditions actually encountered during sampling, and equipped with a temperature gauge (dial thermometer, or equivalent) capable of measuring temperature to within 3° C (5.4° F).

2.1.11 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.12 Vacuum Gauge and Rotameter. At least 760 mm Hg (30 in. Hg) gauge and 0-40 cc/min rotameter, to be used for leak check of the sampling train.

2.2 Sample Recovey.

2.2.1 Wash bottles. Polyethylene or glass, 500 ml, two.

2.2.2 Storage Bottles. Polyethylene, 100 ml, to store impinger samples (one per sample).

2.3 Analysis.

2.3.1 Pipettes. Volumetric type, 5-ml, 20-ml (one per sample), and 25-ml sizes.

2.3.2 Volumetric Flasks. 100-ml size (one per sample) and 1000 ml size.

2.3.3 Burettes. 5- and 50-ml sizes.

2.3.4 Erlenmeyer Flasks. 250 ml-size (one for each sample, blank, and standard).

2.3.5 Dropping Bottle. 125-ml size, to add indicator.

2.3.6 Graduated Cylinder. 100-ml size.

2.3.7 Spectrophotometer. To measure absorbance at 352 nanometers.

3. *Reagents*

Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society. Where such specifications are not available, use the best available grade.

3.1 Sampling.

3.1.1 Water. Deionized, distilled to conform to ASTM specification D1193-74, Type 3. At the fption of the analyst, the $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

3.1.2 Isopropanol, 80 percent. Mix 80 ml of isopropanol with 20 ml of deionized, distilled water. Check each lot of isopropanol for peroxide impurities as follows: shake 10 ml of isopropanol with 10 ml of freshly prepared 10 percent potassium iodide solution. Prepare a blank by similarly treating 10 ml of distilled water. After 1 minute, read the absorbance at 352 nanometers on a spectrophotometer. If absorbance exceeds 0.1, reject alcohol for use.

Peroxides may be removed from isopropanol by redistilling or by passage through a column of activated alumina; however, reagent grade isopropanol with suitably low peroxide levels may be obtained from commercial sources. Rejection of contaminated lots may, therefore, be a more effi ient procedure.

3.1.3 Hydrogen Peroxide, 3 Percent. Dilute 30 percent hydrogen peroxide 1:9 (v/v) with deionized, distilled water (30 ml is needed per sample). Prepare fresh daily.

3.1.4 Potassium Iodide Solution, 10 Percent. Dissolve 10.0 grams KI in deionized, distilled water and dilute to 100 ml. Prepare when needed.

3.2 Sample Recovery.

3.2.1 Water. Deionized, distilled, as in 3.1.1.

3.2.2 Isopropanol, 80 Percent. Mix 80 ml of isopropanol with 20 ml of deionized, distilled water.

3.3 Analysis.

3.3.1 Water. Deionized, distilled, as in 3.1.1.

3.3.2 Isopropanol, 100 percent.

3.3.3 Thorin Indicator. 1-(o-arsonophenylazo)-2-naphthol-3,6-disulfonic acid, disodium salt, or equivalent. Dissolve 0.20 g in 100 ml of deionized, distilled water.

3.3.4 Barium Perchlorate Solution, 0.0100 N. Dissolve 1.95 g of barium perchlorate trihydrate [$Ba(ClO_4)_2 \cdot 3H_2O$] in 200 ml distilled water and dilute to 1 liter with isopropanol. Alternatively, 1.22 g of [$BaCl_2 \cdot 2H_2O$] may be used instead of the perchlorate. Standardize as in Section 5.5.

3.3.5 Sulfuric Acid Standard, 0.0100 N. Purchase or standardize to ±0.0002 N against 0.0100 N NaOH which has previously been standardized against potassium acid phthalate (primary standard grade).

4. *Procedure.*

4.1 Sampling.

4.1.1 Preparation of collection train. Measure 15 ml of 80 percent isopropanol into the midget bubbler and 15 ml of 3 percent hydrogen peroxide into each of the first two midget impingers. Leave the final midget impinger dry. Assemble the train as shown in Figure 6e1. Adjust probe heater to a temperature sufficient to prevent water condensation. Place crushed ice and water around the impingers.

4.1.2 Leak-check procedure. A leak check prior to the sampling run is optional; however, a leak check after the sampling run is mandatory. The leak-check procedure is as follows:

Temporarily attach a suitable (e.g., 0-40 cc/min) rotameter to the outlet of the dry gas meter and place a vacuum gauge at or near the probe inlet. Plug the probe inlet, pull a vaccum of at least 250 mm Hg (10 in. Hg), and note the flow rate as indicated by the rotameter. A leakage rate not in excess of 2 percent of the average sampling rate is acceptable.

NOTE: Carefully release the probe inlet plug before turning off the pump.

It is suggested (not mandatory) that the pump be leak-checked separately, either prior to or after the sampling run. If done prior to the sampling run, the pump leak-check shall precede the leak check of the sampling train described immediately above; if done after the sampling run, the pump leak-check shall follow the train leak-check. To leak check the pump, proceed as follows: Disconnect the drying tube from the probe-impinger assembly. Place a vacuum gauge at the inlet to either the trying tube or the pump, pull a vacuum of 250 mm (10 in.) Hg, plug or pinch off the outlet of the flow meter and then turn off the pump. The vacuum should remain stable for at least 30 seconds.

Other leak-check procedures may be used, subject to the approval of the Adminstrator, U.S. Environmental Protection Agency.

4.1.3 Sample collection. Record the initial dry gas meter reading and barometric pressure. To begin sampling, position the tip of the probe at the sampling point, connect the probe to the bubbler, and start the pump. Adjust the sample flow to a constant rate of approximately 1.0 liter/min as indicated by the rotameter. Maintain this constant rate (±10 percent) during the entire sampling run. Take readings (dry gas meter, tempertures at dry gas meter and at impinger outlet and rate meter) at least every 5 minutes. Add more ice during the run to keep the temperture of the gases leaving the last impinger at 20° C (68° F) or less. At the conclusion of each run, turn off the pump, remove probe from the stack, and record the final readings. Conduct a leak

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check as in Section 4.1.2 (This leak check is mandatory.) If a leak is found, void the test run, or use procedures acceptable to the Administrator to adjust the sample volume for the leakage. Drain the ice bath, and purge the remaining part of the train by drawing clean ambient air through the system for 15 minutes at the sampling rate.

Clean ambient air can be provided by passing air through a charcoal filter or through an extra midget impinger with 15 ml of 3 percent H_2O_2. The tester may opt to simply use ambient air, without purification.

4.2 Sample Recovery. Disconnect the impingers after purging. Discard the contents of the midget bubbler. Pour the contents of the midget impingers into a leak-free polyethylene bottle for shipment. Rinse the three midget impingers and the connecting tubes with deionized, distilled water, and add the washings to the same storage container. Mark the fluid level. Seal and identify the sample container.

4.3 Sample Analysis. Note level of liquid in container, and confirm whether any sample was lost during shipment; note this on analytical data sheet. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.

Transfer the contents of the storage container to a 100-ml volumetric flask and dilute to exactly 100 ml with deionized, distilled water. Pipette a 20-ml aliquot of this solution into a 250-ml Erlenmeyer flask, add 80 ml of 100 percent isopropanol and two to four drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat and average the titration volumes. Run a blank with each series of samples. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is larger.

NOTE: Protect the 0.0100 N barium perchlorate solution from evaporation at all times.

5. *Calibration*

5.1 Metering System.

5.1.1 Initial Calibration. Before its initial use in the field, first leak check the metering system (drying tube, needle valve, pump, rotameter, and dry gas meter) as follows: place a vacuum gauge at the inlet to the drying tube and pull a vaccum of 250 mm (10 in.) Hg; plug or pinch off the outlet of the flow meter, and then turn off the pump. The vaccum shall remain stable for at least 30 seconds. Carefully release the vaccum gauge before releasing the flow meter end.

Next, calibrate the metering system (at the sampling flow rate specified by the method) as follows: connect an appropriately sized wet test meter (e.g., 1 liter per revolution) to the inlet of the drying tube. Make three independent calibration runs, using at least five revolutions of the dry gas meter per run. Calculate the calibration factor, Y (wet test meter calibration volume divided by the dry gas meter volume, both volumes adjusted to the same reference temperature and pressure), for each run, and average the results. If any Y value deviates by more than 2 percent from the average, the metering system is unacceptable for use. Otherwise, use the average as the calibration factor for subsequent test runs.

5.1.2 Post-Test Calibration Check. After each field test series, conduct a calibration check as in Section 5.1.1 above, except for the following variations: (a) the leak check is not to be conducted, (b) three, or more revolutions of the dry gas meter may be used, and (c) only two independent runs need be made. If the calibration factor does not deviate by more than 5 percent from the initial calibration factor (determined in Section 5.1.1), then the dry gas meter volumes obtained during the test series are acceptable. If the calibration factor deviates by more than 5 percent, recalibrate the metering system as in Section 5.1.1, and for the calculations, use the calibration factor (initial or recalibration) that yields the lower gas volume for each test run.

5.2 Thermometers. Calibrate against mercury-in-glass thermometers.

5.3 Rotameter. The rotameter need not be calibrated but should be cleaned and maintained according to the manufacturer's instruction.

5.4 Barometer. Calibrate against a mercury barometer.

5.5 Barium Perchlorate Solution. Standardize the barium perchlorate solution against 25 ml of standard sulfuric acid to which 100 ml of 100 percent isopropanol has been added.

6. *Calculations*

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

6.1 Nomenclature.

C_{so_2} = Concentration of sulfur dioxide, dry basis corrected to standard conditions, mg/dscm (lb/dscf).

N = Normality of barium perchlorate titrant, milliequivalents/ml.

P_{bar} = Barometric pressure at the exit orifice of the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

T_m = Average dry gas meter absolute temperature, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528° R).

V_a = Volume of sample aliquot titrated, ml.

V_m = Dry gas volume as measured by the dry gas meter, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

V_{soln} = Total volume of solution in which the sulfur dioxide sample is contained, 100 ml.

V_t = Volume of barium perchlorate titrant used for the sample, ml (average or replicate titrations).

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml.

Y = Dry gas meter calibration factor.

32.03 = Equivalent weight of sulfur dioxide.

6.2 Dry sample gas volume, corrected to standard conditions.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar}}{P_{std}}\right) = K_1 Y \frac{V_m P_{bar}}{T_m}$$

Equation 6-1

where:

K_1 = 0.3858° K/mm Hg for metric units.
= 17.64° R/in. Hg for English units.

6.3 Sulfur dioxide concentration.

$$C_{SO_2} = K_2 \frac{(V_t - V_{tb})\ N\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)}}$$

Equation 6-2

where:

K_2 = 32.03 mg/meq. for metric units.
= 7.061×10^{-5} lb/meq. for English units.

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Method 7—Determination of Nitrogen Oxide Emissions From Stationary Sources

1. *Principle and Applicability*

1.1 Principle. A grab sample is collected in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution, and the nitrogen oxides, except nitrous oxide, are measured colorimeterically using the phenoldisulfonic acid (PDS) procedure.

1.2 Applicability. This method is applicable to the measurement of nitrogen oxides emitted from stationary sources. The range of the method has been determined to be 2 to 400 milligrams NO_x (as NO_2) per dry standard cubic meter, without having to dilute the sample.

2. *Apparatus*

2.1 Sampling (see Figure 7-1). Other grab sampling systems or equipment, capable of measuring sample volume to within ±2.0 percent and collecting a sufficient sample volume to allow analytical reproducibility to within ±5 percent, will be considered acceptable alternatives, subject to approval of the Administrator, U.S. Environmental Protection Agency. The following equipment is used in sampling:

2.1.1 Probe. Borosilicate glass tubing, sufficiently heated to prevent water condensation and equipped with an in-stack or out-stack filter to remove particulate matter (a plug of glass wool is satisfactory for this purpose). Stainless steel or Teflon [3] tubing may also be used for the probe. Heating is not necessary if the probe remains dry during the purging period.

[3] Mention of trade names or specific products does not constitue endorsement by the Environmental Protection Agency.

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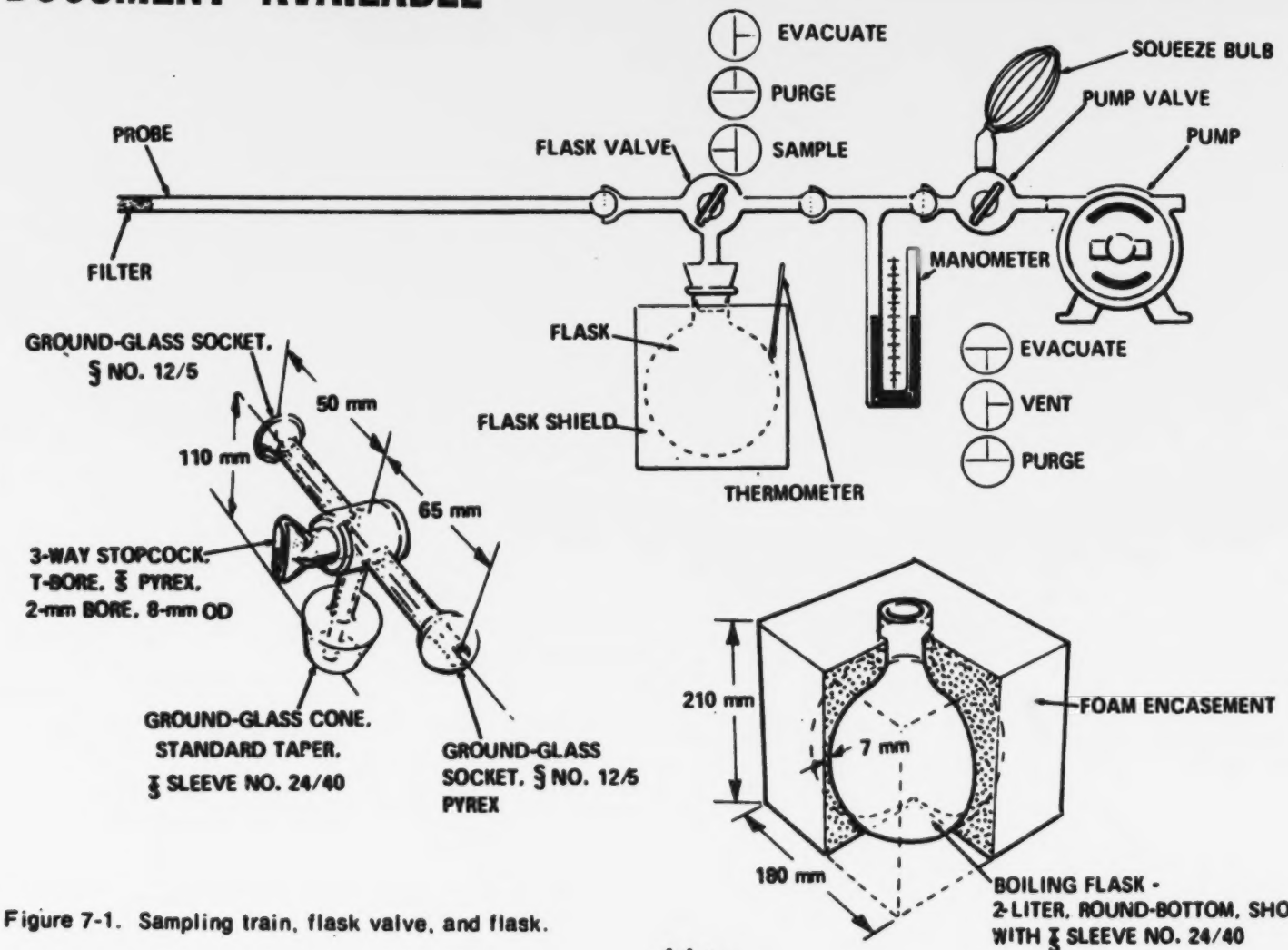

Figure 7-1. Sampling train, flask valve, and flask.

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2.1.2 Collection Flask. Two-liter borosilicate, round bottom flask, with short neck and 24/40 standard taper opening, protected against implosion or breakage.

2.1.3 Flask Valve. T-bore stopcock connected to a 24/40 standard taper joint.

2.1.4 Temperature Gauge. Dial-type thermometer, or other temperature gauge, capable of measuring 1° C (2° F) intervals from −5 to 50° C (25 to 125° F).

2.1.5 Vacuum Line. Tubing capable of withstanding a vacuum of 75 mm Hg (3 in. Hg) absolute pressure, with "T" connection and T-bore stopcock.

2.1.6 Vacuum Gauge. U-tube manometer, 1 meter (36 in.), with 1-mm (0.1-in.) divisions, or other gauge capable of measuring pressure to within ±2.5 mm Hg (0.10 in. Hg).

2.1.7 Pump. Capable of evacuating the collection flask to a pressure equal to or less than 75 mm Hg (3 in. Hg) absolute.

2.1.8 Squeeze Bulb. One-way.

2.1.9 Volumetric Pipette. 25 ml.

2.1.10 Stopcock and Ground Joint Grease. A high-vacuum, high-temperature chlorofluorocarbon grease is required. Halocarbon 25-5S has been found to be effective.

2.1.11 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase, or vice versa for elevation decrease.

2.2 Sample Recovery. The following equipment is required for sample recovery:

2.2.1 Graduated Cylinder. 50 ml with 1-ml divisions.

2.2.2 Storage Containers. Leak-free polyethylene bottles.

2.2.3 Wash Bottle. Polyethylene or glass.

2.2.4 Glass Stirring Rod.

2.2.5 Test Paper for Indicating pH. To cover the pH range of 7 to 14.

2.3 Analysis. For the analysis, the following equipment is needed:

2.3.1 Volumetric Pipettes. Two 1 ml, two 2 ml, one 3 ml, one 4 ml, two 10 ml, and one 25 ml for each sample and standard.

2.3.2 Porcelain Evaporating Dishes. 175- to 250-ml capacity with lip for pouring, one for each sample and each standard. The Coors No. 45006 (shallow-form, 195 ml) has been found to be satisfactory. Alternatively, polymethyl pentene beakers (Nalge No. 1203, 150 ml), or glass beakers (150 ml) may be used. When glass beakers are used, etching of the beakers may cause solid matter to be present in the analytical step; the solids should be removed by filtration (see Section 4.3).

2.3.3 Steam Bath. Low-temperature ovens or thermostatically controlled hot plates kept below 70° C (160° F) are acceptable alternatives.

2.3.4 Dropping Pipette or Dropper. Three required.

2.3.5 Polyethylene Policeman. One for each sample and each standard.

2.3.6 Graduated Cylinder. 100 ml with 1-ml divisions.

2.3.7 Volumetric Flasks. 50 ml (one for each sample and each standard), 100 ml (one for each sample and each standard, and one for the working standard KNO_3 solution), and 1000 ml (one).

2.3.8 Spectrophotometer. To measure absorbance at 410 nm.

2.3.9 Graduated Pipette. 10 ml with 0.1-ml divisions.

2.3.10 Test Paper for Indicating pH. To cover the pH range of 7 to 14.

2.3.11 Analytical Balance. To measure to within 0.1 mg.

3. *Reagents*

Unless otherwise indicated, it is intended that all reagents conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available; otherwise, use the best available grade.

3.1 Sampling. To prepare the absorbing solution, cautiously add 2.8 ml concentrated H_2SO_4 to 1 liter of deionized, distilled water. Mix well and add 6 ml of 3 percent hydrogen peroxide, freshly prepared from 30 percent hydrogen peroxide solution. The absorbing solution should be used within 1 week of its preparation. Do not expose to extreme heat or direct sunlight.

3.2 Sample Recovery. Two reagents are required for sample recovery:

3.2.1 Sodium Hydroxide (1*N*). Dissolve 40 g NaOH in deionized, distilled water and dilute to 1 liter.

3.2.2 Water. Deionized, distilled to conform to ASTM specification D1193-74, Type 3. At the option of the analyst, the $KMNO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

3.3 Analysis. For the analysis, the following reagents are required:

3.3.1 Fuming Sulfuric Acid. 15 to 18 percent by weight free sulfur trioxide. HANDLE WITH CAUTION.

3.3.2 Phenol. White solid.

3.3.3 Sulfuric Acid. Concentrated, 95 percent minimum assay. HANDLE WITH CAUTION.

3.3.4 Potassium Nitrate. Dried at 105 to 110° C (220 to 230° F) for a minimum of 2 hours just prior to preparation of standard solution.

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3.3.5 Standard KNO_3 Solution. Dissolve exactly 2.198 g of dried potassium nitrate (KNO_3) in deionized, distilled water and dilute to 1 liter with deionized, distilled water in a 1,000-ml volumetric flask.

3.3.6 Working Standard KNO_3 Solution. Dilute 10 ml of the standard solution to 100 ml with deionized distilled water. One milliliter of the working standard solution is equivalent to 100 μg nitrogen dioxide (NO_2).

3.3.7 Water. Deionized, distilled as in Section 3.2.2.

3.3.8 Phenoldisulfonic Acid Solution. Dissolve 25 g of pure white phenol in 150 ml concentrated sulfuric acid on a steam bath. Cool, add 75 ml fuming sulfuric acid, and heat at 100° C (212° F) for 2 hours. Store in a dark, stoppered bottle.

4. *Procedures*

4.1 Sampling.

4.1.1 Pipette 25 ml of absorbing solution into a sample flask, retaining a sufficient quantity for use in preparing the calibration standards. Insert the flask valve stopper into the flask with the valve in the "purge" position. Assemble the sampling train as shown in Figure 7-1 and place the probe at the sampling point. Make sure that all fittings are tight and leak-free, and that all ground glass joints have been properly greased with a high-vacuum, high-temperature chlorofluorocarbon-based stopcock grease. Turn the flask valve and the pump valve to their "evacuate" positions. Evacuate the flask to 75 mm Hg (3 in. Hg) absolute pressure, or less. Evacuation to a pressure approaching the vapor pressure of water at the existing temperature is desirable. Turn the pump valve to its "vent" position and turn the off the pump. Check for leakage by observing the manometer for any pressure fluctuation. (Any variation greater than 10 mm Hg (0.4 in. Hg) over a period of 1 minute is not acceptable, and the flask is not to be used until the leakage problem is corrected. Pressure in the flask is not to exceed 75 mm Hg (3 in. Hg) absolute at the time sampling is commenced.) Record the volume of the flask and valve (V_f), the flask temperature (T_i), and the barometric pressure. Turn the flask valve counterclockwise to its "purge" position and do the same with the pump valve. Purge the probe and the vacuum tube using the squeeze bulb. If condensation occurs in the probe and the flask valve area, heat the probe and purge until the condensation disappears. Next, turn the pump valve to its "vent" position. Turn the flask valve clockwise to its "evacuate" position and record the difference in the mercury levels in the manometer. The absolute internal pressure in the flask (V_i) is equal to the barometric pressure less the manometer reading. Immediately turn the flask valve to the "sample" position and permit the gas to enter the flask until pressures in the flask and sample line (i.e., duct, stack) are equal. This will usually require about 15 seconds; a longer period indicates a "plug" in the probe, which must be corrected before sampling is continued. After collecting the sample, turn the flask valve to its "purge" position and disconnect the flask from the sampling train. Shake the flask for at least 5 minutes.

4.1.2 If the gas being sampled contains insufficient oxygen for the conversion of NO to NO_2 (e.g., an applicable subpart of the standard may require taking a sample of a calibration gas mixture of NO in N_2), then oxygen shall be introduced into the flask to permit this conversion. Oxygen may be introduced into the flask by one of three methods; (1) Before evacuating the sampling flask, flush with pure cylinder oxygen, then evacuate flask to 75 mm Hg (3 in. Hg) absolute pressure or less; or (2) inject oxygen into the flask after sampling; or (3) terminate sampling with a minimum of 50 mm Hg (2 in. Hg) vacuum remaining in the flask, record this final pressure, and then vent the flask to the atmosphere until the flask pressure is almost equal to atmospheric pressure.

4.2 Sample Recovery. Let the flask set for a minimum of 16 hours and then shake the contents for 2 minutes. Connect the flask to a mercury filled U-tube manometer. Open the valve from the flask to the manometer and record the flask temperature (T_f), the barometric pressure, and the difference between the mercury levels in the manometer. The absolute internal pressure in the flask (P_f) is the barometric pressure less the manometer reading. Transfer the contents of the flask to a leak-free polyethylene bottle. Rinse the flask twice with 5-ml portions of deionized, distilled water and add the rinse water to the bottle. Adjust the pH to between 9 and 12 by adding sodium hydroxide (1 N), dropwise (about 25 to 35 drops). Check the pH by dipping a stirring rod into the solution and then touching the rod to the pH test paper. Remove as little material as possible during this step. Mark the height of the liquid level so that the container can be checked for leakage after transport. Label the container to clearly identify its contents. Seal the container for shipping.

4.3 Analysis. Note the level of the liquid in container and confirm whether or not any sample was lost during shipment; note this on the analytical data sheet. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Immediately prior to analysis, transfer the contents of the shipping container to a 50-ml volumetric flask, and rinse the container twice with 5-ml portions of deionized, distilled water. Add the

rinse water to the flask and dilute to the mark with deionized, distilled water; mix thoroughly. Pipette a 25-ml aliquot into the procelain evaporating dish. Return any unused portion of the sample to the polyethylene storage bottle. Evaporate the 25-ml aliquot to dryness on a steam bath and allow to cool. Add 2 ml phenoldisulfonic acid solution to the dried residue and triturate thoroughly with a polyethylene policeman. Make sure the solution contacts all the residue. Add 1 ml deionized, distilled water and four drops of concentrated sulfuric acid. Heat the solution on a steam bath for 3 minutes with occasional stirring. Allow the solution to cool, add 20 ml deionized, distilled water, mix well by stirring, and add concentrated ammonium hydroxide, dropwise, with constant stirring, until the pH is 10 (as determined by pH paper). If the sample contains solids, these must be removed by filtration (centrifugation is an acceptable alternative, subject to the approval of the Administrator), as follows: filter through Whatman No. 41 filter paper into a 100-ml volumetric flask; rinse the evaporating dish with three 5-ml portions of deionized, distilled water; filter these three rinses. Wash the filter with at least three 15-ml portions of deionized, distilled water. Add the filter washings to the contents of the volumetric flask and dilute to the mark with deionized, distilled water. If solids are absent, the solution can be transferred directly to the 100-ml volumetric flask and diluted to the mark with deionized, distilled water. Mix the contents of the flask thoroughly, and measure the absorbance at the optimum wavelength used for the standards (Section 5.2.1), using the blank solution as a zero reference. Dilute the sample and the blank with equal volumes of deionized, distilled water if the absorbance exceeds A_4, the absorbance of the 400 μg NO_2 standard (see Section 5.2.2).

5. *Calibration*

5.1 Flask Volume. The volume of the collection flask-flask valve combination must be known prior to sampling. Assemble the flask and flask valve and fill with water, to the stopcock. Measure the volume of water to ±10 ml. Record this volume on the flask.

5.2 Spectrophotometer Calibration.

5.2.1 Optimum Wavelength Determination. Calibrate the wavelength scale of the spectrophotometer every 6 months. The calibration may be accomplished by using an energy source with an intense line emission such as a mercury lamp, or by using a series of glass filters spanning the measuring range of the spectrophotometer. Calibration materials are available commercially and from the National Bureau of Standards. Specific details on the use of such materials should be supplied by the vendor; general information about calibration techniques can be obtained from general reference books on analytical chemistry. The wavelength scale of the spectrophotometer must read correctly within ± 5 nm al all calibration points; otherwise, the specrophotometer shall be repaired and recalibrated. Once the wavelength scale of the spectrophotometer is in proper calibration, use 410 nm as the optimum wavelength for the measurement of the absorbance of the standards and samples.

Alternatively, a scanning procedure may be employed to determine the proper measuring wavelength. If the instrument is a double-beam spectrophotometer, scan the spectrum between 400 and 415 nm using a 200 μg NO_2 standard solution in the sample cell and a blank solution in the reference cell. If a peak does not occur, the spectrophotometer is probably malfunctioning and should be repaired. When a peak is obtained within the 400 to 415 nm range, the wavelength at which this peak occurs shall be the optimum wavelength for the measurement of absorbance of both the standards and the samples. For a single-beam spectrophotometer, follow the scanning procedure described above, except that the blank and standard solutions shall be scanned separately. The optimum wavelength shall be the wavelength at which the maximum difference in absorbance between the standard and the blank occurs.

5.2.2 Determination of Spectrophotometer Calibration Factor K_c. Add 0.0 ml, 2 ml, 4 ml, 6 ml., and 8 ml of the KNO_3 working standard solution (1 ml=100 μg NO_2) to a series of five 50-ml volumetric flasks. To each flask, add 25 ml of absorbing solution, 10 ml deionized, distilled water, and sodium hydroxide (1 N) dropwise until the pH is between 9 and 12 (about 25 to 35 drops each). Dilute to the mark with deionized, distilled water. Mix thoroughly and pipette a 25-ml aliquot of each solution into a separate porcelain evaporating dish. Beginning with the evaporation step, follow the analysis procedure of Section 4.3 until the solution has been transferred to the 100 ml volumetric flask and diluted to the mark. Measure the absorbance of each solution, at the optimum wavelength, as determined in Section 5.2.1. This calibration procedure must be repeated on each day that samples are analyzed. Calculate the spectrophotometer calibration factor as follows:

$$K_c = 100 \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

Equation 16-1

where:

K_c = Calibration factor

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A_1 = Absorbance of the 100-μg NO_2 standard
A_2 = Absorbance of the 200-μg NO_2 standard
A_3 = Absorbance of the 300-μg NO_2 standard
A_4 = Absorbance of the 400-μg NO_2 standard

5.3 Barometer. Calibrate against a mercury barometer.

5.4 Temperature Gauge. Calibrate dial thermometers against mercury-in-glass thermometers.

5.5 Vacuum Gauge. Calibrate mechanical gauges, if used, against a mercury manometer such as that specified in 2.1.6.

5.6 Analytical Balance. Calibrate against standard weights.

6. *Calculations*

Carry out the calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculations.

6.1 Nomenclature.

A = Absorbance of sample.
C = Concentration of NO_x as NO_2, dry basis, corrected to standard conditions, mg/dscm (lb/dscf).
F = Dilution factor (i.e., 25/5, 25/10, etc., required only if sample dilution was needed to reduce the absorbance into the range of calibration).
K_c = Spectrophotometer calibration factor.
m = Mass of NO_x as NO_2 in gas sample, μg.
P_f = Final absolute pressure of flask, mm Hg (in. Hg).
P_i = Initial absolute pressure of flask, mm Hg (in. Hg).
P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
T_f = Final absolute temperature of flask, °K (°R).
T_i = Initial absolute temperature of flask, °K (°R).
T_{std} = Standard absolute temperature 293° K (528° R)
V_{sc} = Sample volume at standard conditions (dry basis), ml.
V_f = Volume of flask and valve, ml.
V_a = Volume of absorbing soluton, 25 ml.
2 = 50/25, the aliquot factor. (If other than a 25-ml aliquot was used for analysis, the corresponding factor must be substituted).

6.2 Sample volume, dry basis, corrected to standard conditions.

$$V_{sc} = \frac{T_{std}}{P_{std}} (V_f - V_a) \left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right]$$

$$= K_1 (V_f - 25\ \text{ml}) \left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right]$$

Equation 7–2

$$K_1 = 0.3858 \frac{°K}{\text{mm Hg}} \text{ for metric units}$$

$$= 17.64 \frac{°R}{\text{in. Hg}} \text{ for English units}$$

6.3 Total μg NO_x per sample.

$$m = 2 K_c A F$$

Equation 7–3

NOTE: If other than a 25-ml aliquot is used for analysis, the factor 2 must be replaced by a corresponding factor.

6.4 Sample concentration, dry basis, corrected to standard conditions.

$$C = K_2 \frac{m}{V_{sc}}$$

Equation 7–4

where:

$$K_2 = 10^3 \frac{\text{mg/m}^3}{\mu\text{g/ml}} \text{ for metric units}$$

$$= 6.243 \times 10^{-5} \frac{\text{lb/scf}}{\mu\text{g/ml}} \text{ for English units}$$

7. *Bibliography*

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Method 8—Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions From Stationary Sources

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted isokinetically from the stack. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated, and both fractions are measured separately by the barium-thorin titration method.

1.2 Applicability. This method is applicable for the detemination of sulfuric acid mist (including sulfur trioxide, and in the absence of other particulate matter) and sulfur dioxide emissions from stationary sources. Collaborative tests have shown that the minimum detectable limits of the method are 0.05 milligrams/cubic meter ($0.03 > 10^{-7}$ pounds/cubic foot) for sulfur trioxide and 1.2 mg/m³ ($0.74\ 10^{-7}$ lb/ft³) for sulfur dioxide. No upper limits have been established. Based on theoretical calculations for 200 milliters of 3 percent hydrogen peroxide solution, the upper concentration limit for sulfur dioxide in a 1.0 m³ (35.3 ft³) gas sample is about 12,500 mg/m³ (7.7×10^{-4} lb/ft³). The upper limit can be extended by increasing the quantity of peroxide solution in the impingers.

Possible interfering agents of this method are fluorides, free ammonia, and dimethyl aniline. If any of these interfering agents are present (this can be determined by knowledge of the process), alternative methods, subject to the approval of the Administrator, U. S. E. P.A., are required.

Filterable particulate matter may be determined along with SO_3 and SO_2 (subject to the approval of the Administrator) by inserting a heated glass fiber filter between the probe and isopronanol impinger (see Section 2.1 of method 6.) If this option is chosen, particulate analysis is gravimetric only; H_2SO_4 acid mist is not determined separately.

2. *Apparatus*

2.1 Sampling. A schematic of the sampling train used in this method is shown in Figure 8-1; it is similiar to the Method 5 train except that the filter position is different and the filter holder does not have to be heated. Commercial models of this train are avaiable. For those who desire to build their own, however, complete construction details are described in APTD-0581. Changes from the APTD-0581 document and allowable modifications to Figure 8-1 are discussed in the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576. Since correct usage is important in obtaining valid results, all users should read the APTD-0576 document and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. Further details and guidelines on operation and maintenance are given in Method 5 and should be read and followed whenever they are applicable.

2.1.1 Probe Nozzle. Same as Method 5, Section 2.1.1.

2.1.2 Probe Liner. Borosilicate or quartz glass, with a heating system to prevent visible condensation during sampling. Do not use metal probe liners.

2.1.3 Pitot Tube. Same as Method 5, Section 2.1.3.

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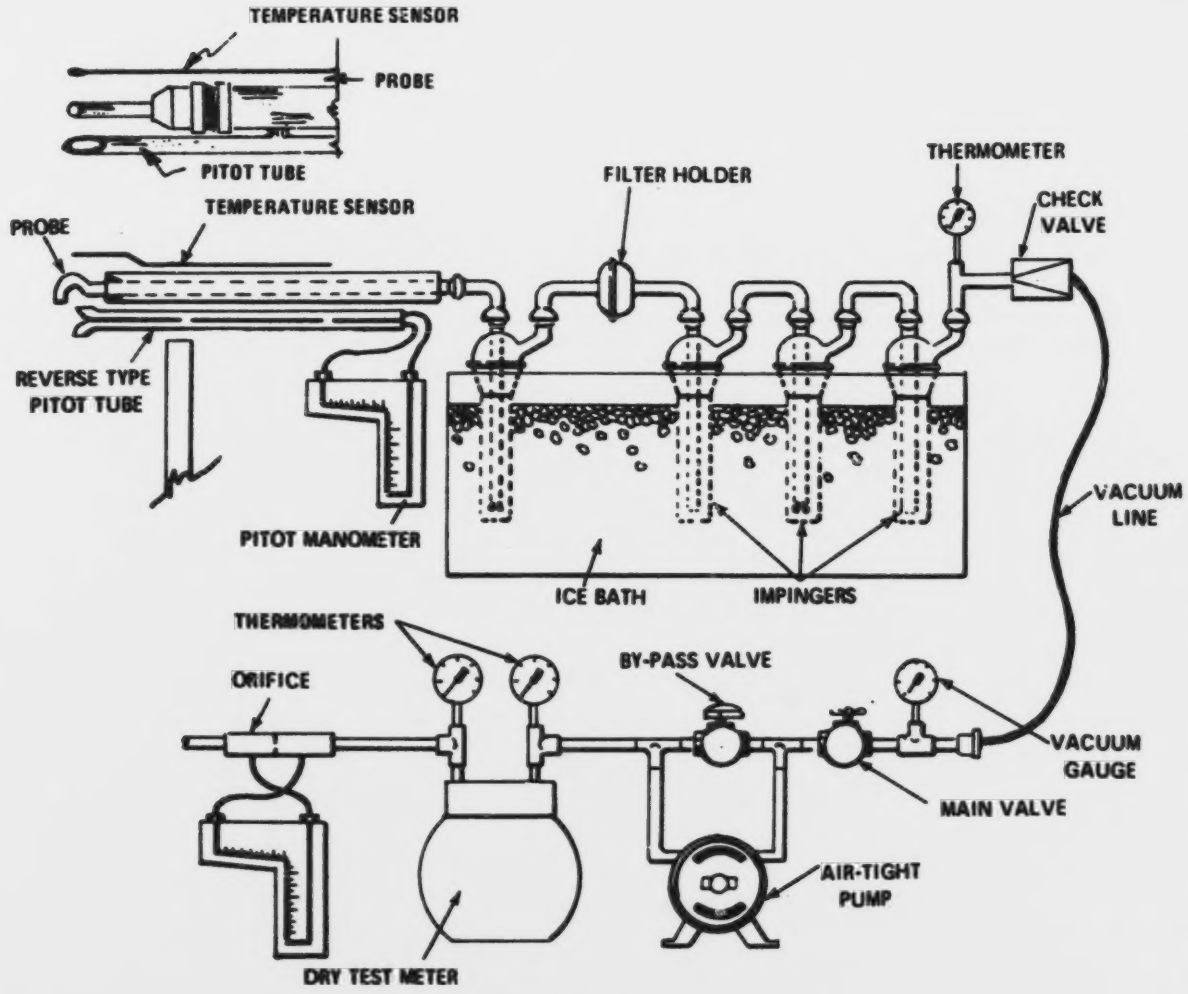

Figure 8-1. Sulfuric acid mist sampling train.

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2.1.4 Differential Pressure Gauge. Same as Method 5, Section 2.1.4.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other gasket materials, e.g., Teflon or Viton, may be used subject to the approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The filter holder shall be placed between the first and second impingers. Note: Do not heat the filter holder.

2.1.6 Impingers—Four, as shown in Figure 8-1. The first and third shall be of the Greenburg-Smith design with standard tips. The second and fourth shall be of the Greenburg-Smith design, modified by replacing the insert with an approximately 13 millimeter (0.5 in.) ID glass tube, having an unconstricted tip located 13 mm (0.5 in.) from the bottom of the flask. Similar collection systems, which have been approved by the Administrator, may be used.

2.1.7 Metering System. Same as Method 5, Section 2.1.8.

2.1.8 Barometer. Same as Method 5, Section 2.1.9.

2.1.9 Gas Density Determination Equipment. Same as Method 5, Section 2.1.10.

2.1.10 Temperature Gauge. Thermometer, or equivalent, to measure the temperature of the gas leaving the impinger train to within 1° C (2° F).

2.2 Sample Recovery.

2.2.1 Wash Bottles. Polyethylene or glass, 500 ml. (two).

2.2.2 Graduated Cylinders. 250 ml, 1 liter. (Volumetric flasks may also be used.

2.2.3 Storage Bottles. Leak-free polyethylene bottles, 1000 ml size (two for each sampling run).

2.2.4 Trip Balance. 500-gram capacity, to measure to ±0.5 g (necessary only if a moisture content analysis is to be done).

2.3 Analysis.

2.3.1 Pipettes. Volumetric 25 ml, 100 ml.

2.3.2 Burette, 50 ml.

2.3.3 Erlenmeyer Flask. 250 ml. (one for each sample blank and standard).

2.3.4. Graduated Cylinder. 100 ml.

2.3.5 Trip Balance. 500 g capacity, to measure to ±0.5g.

2.3.6 Dropping Bottle. To add indicator solution, 125-ml size.

3. *Reagents*

Unless otherwise indicated, all reagents are to conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Otherwise, use the best available grade.

3.1 Sampling.

3.1.1 Filters. Same as Method 5, Section 3.1.1.

3.1.2 Silica Gel. Same as Method 5, Section 3.1.2.

3.1.3 Water. Deionized, distilled to conform to ASTM specification D1193-74, Type 3. At the option of the analyst, the $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

3.1.4 Isopropanol. 80 Percent. Mix 800 ml of isopropanol with 200 ml of deionized, distilled water.

NOTE: Experience has shown that only A.C.S. grade isopropanol is satisfactory. Tests have shown that isopropanol obtained from commerical sources occasionally has peroxide impurities that will cause erroneously high sulfuric acid mist measurement. Use the following test for detecting peroxides in each lot of isopropanol: Shake 10 ml of the isopropanol with 10 ml of freshly prepared 10 percent potassium iodide solution. Prepare a blank by similarly treating 10 ml of distilled water. After 1 minute, read the absorbance on a spectrophotometer at 352 nanometers. If the absorbance exceeds 0.1, the isopropanol shall not be used. Peroxides may be removed from isopropanol by redistilling, or by passage through a column of activated alumina. However, reagent- rade isopropanol with suitably low peroxide levels is readily available from commercial sources; therefore, rejection of contaminated lots may be more efficient than following the peroxide removal procedure.

3.1.5 Hydrogen Peroxide. 3 Percent. Dilute 100 ml of 30 percent hydrogen peroxide to 1 liter with deionized, distilled water. Prepare fresh daily.

3.1.6 Crushed Ice.

3.2 Sample Recovery.

3.2.1 Water. Same as 3.1.3.

3.2.2 Isopropanol, 80 Percent. Same as 3.1.4.

3.3 Analysis.

3.3.1 Water. Same as 3.1.3.

3.3.2 Isopropanol, 100 Percent.

3.3.3 Thorin Indicator. 1-(o-arsonophenylazo) 2-naphthol-3, 6-disulfonic acid, disodium salt, or equivalent. Dissolve 0.20 g in 100 ml of deionized, distilled water.

3.3.4 Barium Perchlorate (0.0100 Normal). Dissolve 1.95 g of barium perchlorate trihydrate ($Ba(ClO_4)_2 \cdot 3H_2O$) in 200 ml deionized, distilled water, and dilute to 1 liter with isopropanol; 1.22 g of barium chloride dihydrate ($BaCl_2 \cdot 2H_2O$) may be used instead of the barium perchlorate. Standardize with sulfuric acid as in Section 5.2. This solution must be protected against evaporation at all times.

3.3.5 Sulfuric Acid Standard (0.0100 N). Purchase or standardize to ±0.0002 N against 0.0100 N NaOH that has previously been standardized against primary standard potassium acid phthalate.

4. *Procedure*

4.1 Sampling.

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4.1.1 Pretest Preparation. Follow the procedure outlined in Method 5, Section 4.1.1; filters should be inspected, but need not be desiccated, weighed, or identified. If the effluent gas can be considered dry, i.e., moisture free, the silica gel need not be weighed.

4.1.2 Preliminary Determinations. Follow the procedure outlined in Method 5, Section 4.1.2.

4.1.3 Preparation of Collection Train. Follow the procedure outlined in Method 5, Section 4.1.3 (except for the second paragraph and other obviously inapplicable parts) and use Figure 8-1 instead of Figure 5-1. Replace the second paragraph with: Place 100 ml of 80 percent isopropanol in the first impinger, 100 ml of 3 percent hydrogen peroxide in both the second and third impingers; retain a portion of each reagent for used as a blank solution. Place about 200g of silica gel in the fourth impinger.

NOTE: If moisture content is to be determined by impinger analysis, weigh each of the first three impingers (plus absorbing solution) to the nearest 0.5 g and record these weights. The weight of the silica gel (or silica gel plus container) must also be determined to the nearest 0.5 g and recorded.

4.1.4 Pretest Leak-Check Procedure. Follow the basic procedure outlined in Method 5, Section 4.1.4.1, noting that the probe heater shall be adjusted to the minimum temperature required to prevent condensation, and also that verbage such as, ". . . plugging the inlet to the filter holder . . .," shall be replaced by, ". . . plugging the inlet to the first impinger . . ." The pretest leak-check is optional.

4.1.5 Train Operation. Follow the basic procedures outlined in Method 5, Section 4.1.5, in conjunction with the following special instructions. Data shall be recorded on a sheet similar to the one in Figure 8-2. The sampling rate shall not exceed 0.030 m^3/min (1.0 cfm) during the run. Periodically during the test, observe the connecting line between the probe and first impinger for signs of condensation. If it does occur, adjust the probe heater setting upward to the minimum temperature required to prevent condensation. If component changes become necessary during a run, a leak-check shall be done immediately before each change, according to the procedure outlined in Section 4.1.4.2 of Method 5 (with appropriate modifications, as mentioned in Section 4.1.4 of this method); record all leak rates. If the leakage rate(s) exceed the specified rate, the tester shall either void the run or shall plan to correct the sample volume as outlined in section 6.3 of Method 5. Immediately after component changes, leak-checks are optional. If these leak-checks are done, the procedure outlined in Section 4.1.4.1 of Method 5 (with appropriate modifications) shall be used.

PLANT _____
LOCATION _____
OPERATOR _____
DATE _____
RUN NO. _____
SAMPLE BOX NO. _____
METER BOX NO. _____
METER ΔHg _____
C FACTOR _____
PITOT TUBE COEFFICIENT, Cp _____

SCHEMATIC OF STACK CROSS SECTION

STATIC PRESSURE, mm Hg (in. Hg) _____
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, m (ft) _____
NOZZLE IDENTIFICATION NO. _____
AVERAGE CALIBRATED NOZZLE DIAMETER, cm (in.) _____
PROBE HEATER SETTING _____
LEAK RATE, m^3/min, (cfm) _____
PROBE LINER MATERIAL _____
FILTER NO. _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	VACUUM mm Hg (in. Hg)	STACK TEMPERATURE (T_s), °C (°F)	VELOCITY HEAD (ΔP_s), mm H_2O (in. H_2O)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER, mm H_2O (in. H_2O)	GAS SAMPLE VOLUME, m^3 (ft^3)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER, °C (°F)
							INLET, °C (°F)	OUTLET, °C (°F)	
TOTAL							Avg	Avg	
AVERAGE							Avg		

Figure 8-2. Field data.

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After turning off the pump and recording the final readings at the conclusion of each run, remove the probe from the stack. Conduct a post-test (mandatory) leak-check as in Section 4.1.4.3 of Method 5 (with appropriate modification) and record the leak rate. If the post-test leakage rate exceeds the specified acceptable rate, the tester shall either correct the sample volume, as outlined in Section 6.3 of Method 5, or shall void the run.

Drain the ice bath and, with the probe disconnected, purge the remaining part of the train, by drawing clean ambient air through the system for 15 minutes at the average flow rate used for sampling.

NOTE: Clean ambient air can be provided by passing air through a charcoal filter. At the option of the tester, ambient air (without cleaning) may be used.

4.1.6 Calculation of Percent Isokinetic. Follow the procedure outlined in Method 5, Section 4.1.6.

4.2 Sample Recovery.

4.2.1 Container No. 1. If a moisture content analysis is to be done, weigh the first impinger plus contents to the nearest 0.5 g and record this weight.

Transfer the contents of the first impinger to a 250-ml graduated cylinder. Rinse the probe, first impinger, all connecting glassware before the filter, and the front half of the filter holder with 80 percent isopropanol. Add the rinse solution to the cylinder. Dilute to 250 ml with 80 percent isopropanol. Add the filter to the solution, mix, and transfer to the storage container. Protect the solution against evaporation. Mark the level of liquid on the container and identify the sample container.

4.2.2 Container No. 2. if a moisture content analysis is to be done, weigh the second and third impingers (plus contents) to the nearest 0.5 g and record these weights. Also, weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g.

Transfer the solutions from the second and third impingers to a 1000-ml graduated cylinder. Rinse all connecting glassware (including back half of filter holder) between the filter and silica gel impinger with deionized, distilled water, and add this rinse water to the cylinder. Dilute to a volume of 1000 ml with deionized, distilled water. Transfer the solution to a storage container. Mark the level of liquid on the container. Seal and identify the sample container.

4.3 Analysis.

Note the level of liquid in containers 1 and 2, and confirm whether or not any sample was lost during shipment; note this on the analytical data sheet. If a noticeable amount of leakage has occured, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.

4.3.1 Container No. 1. Shake the container holding the isopropanol solution and the filter. If the filter breaks up, allow the fragments to settle for and few minutes before removing a sample. Pipette a 100-ml aliquot of this solution into a 250-ml Erlenmeyer flask, add 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is greater.

4.3.2 Container No. 2. Thoroughly mix the solution in the container holding the contents of the second and third impingers. Pipette a 10-ml aliquot of sample into a 250-ml Erlenmeyer flask. Add 40 ml of isopropanol, 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is greater.

4.3.3 Blanks. Prepare blanks by adding 2 to 4 drops of thorin indicator to 100 ml of 80 percent isopropanol. Titrate the blanks in the same manner as the samples.

5. *Calibration.*

5.1 Calibrate equipment using the procedures specified in the following sections of Method 5: Section 5.3 (metering system); Section 5.5 (termperature gauges); Section 5.7 (barometer). Note that the recommended leak-check of the metering system, described in Section 5.6 of Method 5, also applies to this method.

5.2 Standardize the barium perchlorate solution with 25 ml of standard sulfuric acid, to which 100 ml of 100 percent isopropanol has been added.

6. *Calculations*

NOTE: Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

6.1 Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream, proportion by volume.

$C_{H_2SO_4}$ = Sulfuric acid (including SO_3) concentration, g/dscm (lb/dscf).

C_{SO_2} = Sulfur dioxide concentration, g/dscm (lb/dscf).

I = Percent of isokinetic sampling.

N = Normality of barium perchlorate titrant, *g equivalents/liter.*

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

T_m = Average absolute dry gas meter temperature (see Figure 8-2), ° K (° R).
T_s = Average absolute stack gas temperature (see Figure 8-2), ° K (° R).
T_{std} = Standard absolute temperature, 293° K (528° R).
V_a = Volume of sample aliquot titrated, 100 ml for H_2SO_4 and 10 ml for SO_2.
V_{lc} = Total volume of liquid collected in impingers and silica gel, ml.
V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).
$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, dscm (dscf).
v_s = Average stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from method 8, m/sec (ft/sec).
V_{soln} = Total volume of solution in which the sufuric acid or sulfur dioxide sample is contained, 250 ml or 1,000 ml, respectively.
V_t = Volume of barium perchlorate titrant used for the sample, ml.
V_{tb} = Volume of barium perchlorate titrant used for the blank, ml.
Y = Dry gas meter calibration factor.
ΔH = Average pressure drop across orifice meter, mm (in.) H_2O.
θ = Total sampling time, min.
13.6 = Specific gravity of mercury.
60 = sec/min.
100 = Conversion to percent.

6.2 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 8-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C and 760 mm Hg or 68° F and 29.92 in. Hg) by using Equation 8-1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right) \frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{P_{std}}$$

$$= K_1 V_m Y \frac{P_{bar} + (\Delta H/13.6)}{T_m}$$

Equation 8-1

where:
K_1 = 0.3858 °K/mm Hg for metric units.
= 17.64 °R/in., Hg for English units.

NOTE: If the leak rate observed during any mandatory leak-checks exceeds the specified acceptable rate, the tester shall either correct the value of V_m in Equation 8-1 (as described in Section 6.3 of Method 5), or shall invalidate the test run.

6.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor using Equation 5-2 of Method 5; the weight of water collected in the impingers and silica gel can be directly converted to milliliters (the specific gravity of water is 1 g/ml). Calculate the moisture content of the stack gas, using Equation 5-3 of Method 5. The "Note" in Section 6.5 of Method 5 also applies to this method. Note that if the effluent gas stream can be considered dry, the volume of water vapor and moisture content need not be calculated.

6.5 Sulfuric acid mist (including SO_3) concentration.

$$C_{H_2SO_4} = K_2 \frac{N(V_t - V_{tb})\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)}}$$

Equation 8-2

where:
K_2 = 0.04904 g/milliequivalent for metric units.
= 1.081×10^{-4} lb/meq for English units.

6.6 Sulfur dioxide concentration.

$$C_{SO_2} = K_3 \frac{N(V_t - V_{tb})\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)}}$$

Equation 8-3

where:
K_3 = 0.03203 g/meq for metric units.
= 7.061×10^{-5} lb/meq for English units.

6.7 Isokinetic Variation.

6.7.1 Calculation from raw data.

$$I = \frac{100 T_s [K_4 V_{lc} + (V_m / T_m) P_{bar} + \Delta H/13.6)]}{60 \theta v_s P_s A_n}$$

Equation 8-4

where:
K_4 = 0.003464 mm Hg-m³/ml-°K for metric units.
= 0.002676 in. Hg-ft³/ml-°R for English units.

6.7.2 Calculation from intermediate values.

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$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} v_s \theta A_n P_s 60 (1-B_{ws})}$$

$$= K_5 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1-B_{ws})}$$

Equation 8–5

where:
K_5=4.320 for metric units.
=0.09450 for English units

6.8 Acceptable Results. If 90 percent <I <110 percent, the results are acceptable. If the results are low in comparison to the standards and I is beyond the acceptable range, the Administrator may opt to accept the results. Use Citation 4 in the Bibliography of Method 5 to make judgments. Otherwise, reject the results and repeat the test.

7. *Bibliography*

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2. Corbett, P. F. The Determination of SO_2 and SO_3 in Flue Gases. Journal of the Institute of Fuel. *24*:237–243. 1961.

3. Martin, Robert M. Construction Details of Isokinetic Source Sampling Equipment. Environmental Protection Agency. Research Triangle Park, N.C. Air Pollution Control Office Publication No. APTD-0581. April, 1971.

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5. Rom, J. J. Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment. Office of Air Programs, Environmental Protection Agency. Research Triangle Park, N.C. APTD-0576. March, 1972.

6. Hamil, H. F. and D. E. Camann. Collaborative Study of Method for Determination of Sulfur Dioxide Emissions from Stationary Sources (Fossil Fuel-Fired Steam Generators). Environmental Protection Agency. Research Triangle Park, N.C. EPA-650/4-74-024. December, 1973.

7. Annual Book of ASTM Standards. Part 31; Water, Atmospheric Analysis. pp. 40–42. American Society for Testing and Materials. Philadelphia, Pa. 1974.

Method 9—Visual Determination of the Opacity of Emissions From Stationary Sources

Many stationary sources discharge visible emissions into the atmosphere; these emissions are usually in the shape of a plume. This method involves the determination of plume opacity by qualified observers. The method includes procedures for the training and certification of observers, and procedures to be used in the field for determination of plume opacity. The appearance of a plume as viewed by an observer depends upon a number of variables, some of which may be controllable and some of which may not be controllable in the field. Variables which can be controlled to an extent to which they no longer exert a significant influence upon plume appearance include: Angle of the observer with respect to the plume; angle of the observer with respect to the sun; point of observation of attached and detached steam plume; and angle of the observer with respect to a plume emitted from a rectangular stack with a large length to width ratio. The method includes specific criteria applicable to these variables.

Other variables which may not be controllable in the field are luminescence and color contrast between the plume and the background against which the plume is viewed. These variables exert an influence upon the appearance of a plume as viewed by an observer, and can affect the ability of the observer to accurately assign opacity values to the observed plume. Studies of the theory of plume opacity and field studies have demonstrated that a plume is most visible and presents the greatest apparent opacity when viewed against a contrasting background. It follows from this, and is confirmed by field trials, that the opacity of a plume, viewed under conditions where a contrasting background is present can be assigned with the greatest degree of accuracy. However, the potential for a positive error is also the greatest when a plume is viewed under such contrasting conditions. Under conditions presenting a less contrasting background, the apparent opacity of a plume is less and approaches zero as the color and luminescence contrast decrease toward zero. As a result, significant negative bias and negative errors can be made when a plume is viewed under less contrasting conditions. A negative bias decreases rather than increases the possibility that a plant operator will be cited for a violation of opacity standards due to observer error.

Studies have been undertaken to determine the magnitude of positive errors which can be made by qualified observers while reading plumes under contrasting conditions and using the procedures set forth in this method. The results of these studies (field trials) which involve a total of 769 sets of 25 readings each are as follows:

(1) For black plumes (133 sets at a smoke generator), 100 percent of the sets were read with a positive error[1] of less than 7.5 per-

[1]For a set, positive error = average opacity determined by observers' 25 observa-

Continued

cent opacity; 99 percent were read with a positive error of less than 5 percent opacity.

(2) For white plumes (170 sets at a smoke generator, 168 sets at a coal-fired power plant, 298 sets at a sulfuric acid plant), 99 percent of the sets were read with a positive error of less than 7.5 percent opacity; 95 percent were read with a positive error of less than 5 percent opacity.

The positive observational error associated with an average of twenty-five readings is therefore established. The accuracy of the method must be taken into account when determining possible violations of applicable opacity standards.

1. *Principle and applicability.*

1.1 Principle. The opacity of emissions from stationary sources is determined visually by a qualified observer.

1.2 Applicability. This method is applicable for the determination of the opacity of emissions from stationary sources pursuant to § 60.11(b) and for qualifying observers for visually determining opacity of emissions.

2. *Procedures.* The observer qualified in accordance with paragraph 3 of this method shall use the following procedures for visually determining the opacity of emissions:

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction, and when observing opacity of emissions from rectangular outlets (e.g. roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g. stub stacks on baghouses).

2.2 Field records. The observer shall record the name of the plant, emission location, type facility, observer's name and affiliation, and the date on a field data sheet (Figure 9-1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

2.3 Observations. Opacity observations shall be made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume, but instead shall observe the plume momentarily at 15-second intervals.

2.3.1 Attached steam plumes. When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible. The observer shall record the approximate distance from the emission outlet to the point in the plume at which the observations are made.

2.3.2 Detached steam plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

2.4 Recording observations. Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. (See Figure 9-2 for an example.) A minimum of 24 observations shall be recorded. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

2.5 Data Reduction. Opacity shall be determined as an average of 24 consecutive observations recorded at 15-second intervals. Divide the observations recorded on the record sheet into sets of 24 consecutive observations. A set is composed of any 24 consecutive observations. Sets need not be consecutive in time and in no case shall two sets overlap. For each set of 24 observations, calculate the average by summing the opacity of the 24 observations and dividing this sum by 24. If an applicable standard specifies an averaging time requiring more than 24 observations, calculate the average for all observations made during the specified time period. Record the average opacity on a record sheet. (See Figure 9-1 for an example.)

3. *Qualifications and testing.*

3.1 Certification requirements. To receive certification as a qualified observer, a candidate must be tested and demonstrate the ability to assign opacity readings in 5 percent increments to 25 different black plumes and 25 different white plumes, with an error not to exceed 15 percent opacity on any one reading and an average error not to exceed 7.5 percent opacity in each category. Candidates shall be tested according to the procedures described in paragraph 3.2. Smoke generators used pursuant to paragraph 3.2 shall be equipped with a smoke meter which meets the requirements of paragraph 3.3.

The certification shall be valid for a period of 6 months, at which time the quali-

Footnote continued
tions—average opacity determined from transmissometer's 25 recordings.

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fication procedure must be repeated by any observer in order to retain certification.

3.2 Certification procedure. The certification test consists of showing the candidate a complete run of 50 plumes—25 black plumes and 25 white plumes—generated by a smoke generator. Plumes within each set of 25 black and 25 white runs shall be presented in random order. The candidate assigns an opacity value to each plume and records his observation on a suitable form. At the completion of each run of 50 readings, the score of the candidate is determined. If a candidate fails to qualify, the complete run of 50 readings must be repeated in any retest. The smoke test may be administered as part of a smoke school or training program, and may be preceded by training or familiarization runs of the smoke generator during which candidates are shown black and white plumes of known opacity.

3.3 Smoke generator specifications. Any smoke generator used for the purposes of paragraph 3.2 shall be equipped with a smoke meter installed to measure opacity across the diameter of the smoke generator stack. The smoke meter output shall display instack opacity based upon a pathlength equal to the stack exit diameter, on a full 0 to 100 percent chart recorder scale. The smoke meter optical design and performance shall meet the specifications shown in Table 9-1. The smoke meter shall be calibrated as prescribed in paragraph 3.3.1 prior to the conduct of each smoke reading test. At the completion of each test, the zero and span drift shall be checked and if the drift exceeds ±1 percent opacity, the condition shall be corrected prior to conducting any subsequent test runs. The smoke meter shall be demonstrated, at the time of installation, to meet the specifications listed in Table 9-1. This demonstration shall be repeated following any subsequent repair or replacement of the photocell or associated electronic circuitry including the chart recorder or output meter, or every 6 months, whichever occurs first.

TABLE 9-1—SMOKE METER DESIGN AND PERFORMANCE SPECIFICATIONS

Parameter	Specification
a. Light source	Incandescent lamp operated at nominal rated voltage.
b. Spectral response of photocell.	Photopic (daylight spectral response of the human eye—reference 4.3).
c. Angle of view	15° maximum total angle.
d. Angle of projection	15° maximum total angle.
e. Calibration error	±3% opacity, maximum.
f. Zero and span drift ±1% opacity, 30 minutes.	
g. Response time	5 seconds.

3.3.1 Calibration. The smoke meter is calibrated after allowing a minimum of 30 minutes warmup by alternately producing simulated opacity of 0 percent and 100 percent. When stable response at 0 percent or 100 percent is noted, the smoke meter is adjusted to produce an output of 0 percent or 100 percent, as appropriate. This calibration shall be repeated until stable 0 percent and 100 percent readings are produced without adjustment. Simulated 0 percent and 100 percent opacity values may be produced by alternately switching the power to the light source on and off while the smoke generator is not producing smoke.

3.3.2 Smoke meter evaluation. The smoke meter design and performance are to be evaluated as follows:

3.3.2.1 Light source. Verify from manufacturer's data and from voltage measurements made at the lamp, as installed, that the lamp is operated within ±5 percent of the nominal rated voltage.

3.3.2.2 Spectral response of photocell. Verify from manufacturer's data that the photocell has a photopic response; i.e., the spectral sensitivity of the cell shall closely approximate the standard spectral-luminosity curve for photopic vision which is referenced in (b) of Table 9-1.

FIGURE 9-1
RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE___of___

COMPANY_____
LOCATION_____
TEST NUMBER_____
DATE_____
TYPE FACILITY_____
CONTROL DEVICE_____

HOURS OF OBSERVATION_____
OBSERVER_____
OBSERVER CERTIFICATION DATE_____
OBSERVER AFFILIATION_____
POINT OF EMISSIONS_____
HEIGHT OF DISCHARGE POINT_____

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge				
Direction from Discharge				
Height of Observation Point				
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction				
Wind Speed				
Ambient Temperature				
SKY CONDITIONS (clear, overcast, % clouds, etc.)				
PLUME DESCRIPTION Color				
Distance Visible				
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start--End	Sum	Average

Readings ranged from ___ to ___ % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

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FIGURE 9-2 OBSERVATION RECORD PAGE ___ OF ___

COMPANY _____ OBSERVER _____
LOCATION _____ TYPE FACILITY _____
TEST NUMBER _____ POINT OF EMISSIONS _____
DATE _____

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

3.3.2.3 Angle of view. Check construction geometry to ensure that the total angle of view of the smoke plume, as seen by the photocell, does not exceed 15°. The total angle of view may be calculated from: $\theta = 2 \tan^{-1} d/2L$, where θ=total angle of view; d=the sum of the photocell diameter+the diameter of the limiting aperture; and L=the distance from the photocell to the limiting aperture. The limiting aperture is the point in the path between the photocell and the smoke plume where the angle of view is most restricted. In smoke generator smoke meters this is normally an orifice plate.

3.3.2.4 Angle of projection. Check construction geometry to ensure that the total angle of projection of the lamp on the smoke plume does not exceed 15°. The total angle of projection may be calculated from:

$\theta = 2 \tan^{-1} d/2L$, where θ = total angle of projection; d = the sum of the length of the lamp filament + the diameter of the limiting aperture; and L = the distance from the lamp to the limiting aperture.

FIGURE 9-2 OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY _____ OBSERVER _____
LOCATION _____ TYPE FACILITY _____
TEST NUMBER _____ POINT OF EMISSIONS _____
DATE _____

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
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	59							

3.3.2.5 Calibration error. Using neutral-density filters of known opacity, check the error between the actual response and the theoretical linear response of the smoke meter. This check is accomplished by first calibrating the smoke meter according to 3.3.1 and then inserting a series of three neutral-density filters of nominal opacity of 20, 50, and 75 percent in the smoke meter pathlength. Filters calibrated within ±2 percent shall be used. Care should be taken when inserting the filters to prevent stray light from affecting the meter. Make a total of five nonconsecutive readings for each

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filter. The maximum error on any one reading shall be 3 percent opacity.

3.3.2.6 Zero and span drift. Determine the zero and span drift by calibrating and operating the smoke generator in a normal manner over a 1-hour period. The drift is measured by checking the zero and span at the end of this period.

3.3.2.7 Response time. Determine the response time by producing the series of five simulated 0 percent and 100 percent opacity values and observing the time required to reach stable response. Opacity values of 0 percent and 100 percent may be simulated by alternately switching the power to the light source off and on while the smoke generator is not operating.

4. *References.*

4.1 Air Pollution Control District Rules and Regulations, Los Angeles County Air Pollution Control District, Regulation IV, Prohibitions, Rule 50.

4.2 Weisburd, Melvin I., Field Operations and Enforcement Manual for Air, U.S. Environmental Protection Agency, Research Triangle Park, N.C., APTD-1100, August 1972, pp. 4.1-4.36.

4.3 Condon, E.U., and Odishaw, H., Handbook of Physics, McGraw-Hill Co., N.Y., N.Y., 1958, Table 3.1, p. 6-52.

Alternate Method 1—Determination of the Opacity of Emissions From Stationary Sources Remotely by Lidar

This alternate method provides the quantitative determination of the opacity of an emissions plume remotely by a mobile lidar system (laser radar; Light Detection and Ranging). The method includes procedures for the calibration of the lidar and procedures to be used in the field for the lidar determination of plume opacity. The lidar is used to measure plume opacity during either day or nighttime hours because it contains its own pulsed light source or transmitter. The operation of the lidar is not dependent upon ambient lighting conditions (light, dark, sunny or cloudy).

The lidar mechanism or technique is applicable to measuring plume opacity at numerous wavelengths of laser radiation. However, the performance evaluation and calibration test results given in support of this method apply only to a lidar that employs a ruby (red light) laser [Reference 5.1].

1. Principle and Applicability

1.1 Principle. The opacity of visible emissions from stationary sources (stacks, roof vents, etc.) is measured remotely by a mobile lidar (laser radar).

1.2 Applicability. This method is applicable for the remote measurement of the opacity of visible emissions from stationary sources during both nighttime and daylight conditions, pursuant to 40 CFR § 60.11(b). It is also applicable for the calibration and performance verification of the mobile lidar for the measurement of the opacity of emissions. A performance/design specification for a basic lidar system is also incorporated into this method.

1.3 Definitions.

Azimuth angle: The angle in the horizontal plane that designates where the laser beam is pointed. It is measured from an arbitrary fixed reference line in that plane.

Backscatter: The scattering of laser light in a direction opposite to that of the incident laser beam due to reflection from particulates along the beam's atmospheric path which may include a smoke plume.

Backscatter signal: The general term for the lidar return signal which results from laser light being backscattered by atmospheric and smoke plume particulates.

Convergence distance: The distance from the lidar to the point of overlap of the lidar receiver's field-of-view and the laser beam.

Elevation angle: The angle of inclination of the laser beam referenced to the horizontal plane.

Far region: The region of the atmosphere's path along the lidar line-of-sight beyond or behind the plume being measured.

Lidar: Acronym for Light Detection and Ranging.

Lidar range: The range or distance from the lidar to a point of interest along the lidar line-of-sight.

Near region: The region of the atmospheric path along the lidar line-of-sight between the lidar's convergence distance and the plume being measured.

Opacity: One minus the optical transmittance of a smoke plume, screen target, etc.

Pick interval: The time or range intervals in the lidar backscatter signal whose minimum average amplitude is used to calculate opacity. Two pick intervals are required, one in the near region and one in the far region.

Plume: The plume being measured by lidar.

Plume signal: The backscatter signal resulting from the laser light pulse passing through a plume.

$1/R^2$ correction: The correction made for the systematic decrease in lidar backscatter signal amplitude with range.

Reference signal: The backscatter signal resulting from the laser light pulse passing through ambient air.

Sample interval: The time period between successive samples for a digital signal or between successive measurements for an analog signal.

Signal spike: An abrupt, momentary increase and decrease in signal amplitude.

Source: The source being tested by lidar.

Time reference: The time (t_o) when the laser pulse emerges from the laser, used as

the reference in all lidar time or range measurements.

2. Procedures.

The mobile lidar calibrated in accordance with Paragraph 3 of this method shall use the following procedures for remotely measuring the opacity of stationary source emissions:

2.1 Lidar Position. The lidar shall be positioned at a distance from the plume sufficient to provide an unobstructed view of the source emissions. The plume must be at a range of at least 50 meters or three consecutive pick intervals (whichever is greater) from the lidar's transmitter/receiver convergence distance along the line-of-sight. The maximum effective opacity measurement distance of the lidar is a function of local atmospheric conditions, laser beam diameter, and plume diameter. The test position of the lidar shall be selected so that the diameter of the laser beam at the measurement point within the plume shall be no larger than three-fourths the plume diameter. The beam diameter is calculated by Equation (AM1-1):

$$D(\text{lidar}) = A + R\phi < 0.75\ D(\text{Plume}) \quad \text{(AM1-1)}$$

where:

D(Plume)=diameter of the plume (cm),
ϕ=laser beam divergence measured in radians
R=range from the lidar to the source (cm)
D(Lidar)=diameter of the laser beam at range R (cm),
A=diameter of the laser beam or pulse where it leaves the laser.

The lidar range, R, is obtained by aiming and firing the laser at the emissions source structure immediately below the outlet. The range value is then determined from the backscatter signal which consists of a signal spike (return from source structure) and the atmospheric backscatter signal [Reference 5.1]. This backscatter signal should be recorded.

When there is more than one source of emissions in the immediate vicinity of the plume, the lidar shall be positioned so that the laser beam passes through only a single plume, free from any interference of the other plumes for a minimum of 50 meters or three consecutive pick intervals (whichever is greater) in each region before and beyond the plume along the line-of-sight (determined from the backscatter signals). The lidar shall initially be positioned so that its line-of-sight is approximately perpendicular to the plume.

When measuring the opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks, etc.), the lidar shall be placed in a position so that its line-of-sight is approximately perpendicular to the longer (major) axis of the outlet.

2.2 Lidar Operational Restrictions. The lidar receiver shall not be aimed within an angle of ± 15° (cone angle) of the sun.

This method shall not be used to make opacity measurements if thunderstorms, snowstorms, hail storms, high wind, high-ambient dust levels, fog or other atmospheric conditions cause the reference signals to consistently exceed the limits specified in Section 2.3.

2.3 Reference Signal Requirements. Once placed in its proper position for opacity measurement, the laser is aimed and fired with the line-of-sight near the outlet height and rotated horizontally to a position clear of the source structure and the associated plume. The backscatter signal obtained from this position is called the ambient-air or reference signal. The lidar operator shall inspect this signal [Section V of Reference 5.1] to: (1) determine if the lidar line-of-sight is free from interference from other plumes and from physical obstructions such as cables, power lines, etc., for a minimum of 50 meters or three consecutive pick intervals (whichever is greater) in each region before and beyond the plume, and (2) obtain a qualitative measure of the homogeneity of the ambient air by noting any signal spikes.

Should there be any signal spikes on the reference signal within a minimum of 50 meters or three consecutive pick intervals (whichever is greater) in each region before and beyond the plume, the laser shall be fired three more times and the operator shall inspect the reference signals on the display. If the spike(s) remains, the azimuth angle shall be changed and the above procedures conducted again. If the spike(s) disappears in all three reference signals, the lidar line-of-sight is acceptable if there is shot-to-shot consistency and there is no interference from other plumes.

Shot-to-shot consistency of a series of reference signals over a period of twenty seconds is verified in either of two ways. (1) The lidar operator shall observe the reference signal amplitudes. For shot-to-shot consistency the ratio of R_f to R_n [amplitudes of the near and far region pick intervals (Section 2.6.1)] shall vary by not more than ± 6% between shots; or (2) the lidar operator shall accept any one of the reference signals and treat the other two as plume signals; then the opacity for each of the subsequent reference signals is calculated (Equation AM1-2). For shot-to-shot consistency, the opacity values shall be within ± 3% of 0% opacity and the associated S_c values less than or equal to 8% (full scale) [Section 2.6].

If a set of reference signals fails to meet the requirements of this section, then all plume signals [Section 2.4] from the last set

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of acceptable reference signals to the failed set shall be discarded.

2.3.1 Initial and Final Reference Signals. Three reference signals shall be obtained within a 90-second time period prior to any data run. A final set of three reference signals shall be obtained within three (3) minutes after the completion of the same data run.

2.3.2 Temporal Criterion for Additional Reference Signals. An additional set of reference signals shall be obtained during a data run if there is a change in wind direction or plume drift of 30° or more from the direction that was prevalent when the last set of reference signals was obtained. An additional set of reference signals shall also be obtained if there is an increase in value of S_{ln} (near region standard deviation, Equation AM1-5) or S_{lf} (far region standard deviation, Equation AM1-6) that is greater than 6% (full scale) over the respective values calculated from the immediately previous plume signal, and this increase in value remains for 30 seconds or longer.An additional set of reference signals shall also be obtained if there is a change in amplitude in either the near or the far region of the plume signal, that is greater than 6% of the near signal amplitude and this change in amplitude remains for 30 seconds or more.

2.4 Plume Signal Requirements. Once properly aimed, the lidar is placed in operation with the nominal pulse or firing rate of six pulses/minute (1 pulse/10 seconds). The lidar operator shall observe the plume backscatter signals to determine the need for additional reference signals as required by Section 2.3.2. The plume signals are recorded from lidar start to stop and are called a data run. The length of a data run is determined by operator discretion. Short-term stops of the lidar to record additional reference signals do not constitute the end of a data run if plume signals are resumed within 90 seconds after the reference signals have been recorded, and the total stop or interrupt time does not exceed 3 minutes.

2.4.1 Non-hydrated Plumes. The laser shall be aimed at the region of the plume which displays the greatest opacity. The lidar operator must visually verify that the laser is aimed clearly above the source exit structure.

2.4.2 Hydrated Plumes. The lidar will be used to measure the opacity of hydrated or so-called steam plumes. As listed in the reference method, there are two types, i.e., attached and detached steam plumes.

2.4.2.1 Attached Steam Plumes. When condensed water vapor is present within a plume, lidar opacity measurements shall be made at a point within the residual plume where the condensed water vapor is no longer visible. The laser shall be aimed into the most dense region (region of highest opacity) of the residual plume.

During daylight hours the lidar operator locates the most dense portion of the residual plume visually. During nighttime hours a high-intensity spotlight, night vision scope, or low light level TV, etc., can be used as an aid to locate the residual plume. If visual determination is ineffective, the lidar may be used to locate the most dense region of the residual plume by repeatedly measuring opacity, along the longitudinal axis or center of the plume from the emissions outlet to a point just beyond the steam plume. The lidar operator should also observe color differences and plume reflectivity to ensure that the lidar is aimed completely within the residual plume. If the operator does not obtain a clear indication of the location of the residual plume, this method shall not be used.

Once the region of highest opacity of the residual plume has been located, aiming adjustments shall be made to the laser line-of-sight to correct for the following: movement to the region of highest opacity out of the lidar line-of-sight (away from the laser beam) for more than 15 seconds, expansion of the steam plume (air temperature lowers and/or relative humidity increases) so that it just begins to encroach on the field-of-view of the lidar's optical telescope receiver, or a decrease in the size of the steam plume (air temperature higher and/or relative humidity decreases) so that regions within the residual plume whose opacity is higher than the one being monitored, are present.

2.4.2.2 Detached Steam Plumes. When the water vapor in a hydrated plume condenses and becomes visible at a finite distance from the stack or source emissions outlet, the opacity of the emissions shall be measured in the region of the plume clearly above the emissions outlet and below condensation of the water vapor.

During daylight hours the lidar operators can visually determine if the steam plume is detached from the stack outlet. During nighttime hours a high-intensity spotlight, night vision scope, low light level TV, etc., can be used as an aid in determining if the steam plume is detached. If visual determination is ineffective, the lidar may be used to determine if the steam plume is detached by repeatedly measuring plume opacity from the outlet to the steam plume along the plume's longitudinal axis or center line. The lidar operator should also observe color differences and plume reflectivity to detect a detached plume. If the operator does not obtain a clear indication of the location of the detached plume, this method shall not be used to make opacity measurements between the outlet and the detached plume.

Once the determination of a detached steam plume has been confirmed, the laser shall be aimed into the region of highest opacity in the plume between the outlet and

the formation of the steam plume. Aiming adjustments shall be made to the lidar's line-of-sight within the plume to correct for changes in the location of the most dense region of the plume due to changes in wind direction and speed or if the detached steam plume moves closer to the source outlet encroaching on the most dense region of the plume. If the detached steam plume should move too close to the source outlet for the lidar to make interference-free opacity measurements, this method shall not be used.

2.5 Field Records. In addition to the recording recommendations listed in other sections of this method the following records should be maintained. Each plume measured should be uniquely identified. The name of the facility, type of facility, emission source type, geographic location of the lidar with respect to the plume, and plume characteristics should be recorded. The date of the test, the time period that a source was monitored, the time (to the nearest second) of each opacity measurement, and the sample interval should also be recorded. The wind speed, wind direction, air temperature, relative humidity, visibility (measured at the lidar's position), and cloud cover should be recorded at the beginning and end of each time period for a given source. A small sketch depicting the location of the laser beam within the plume should be recorded.

If a detached or attached steam plume is present at the emissions source, this fact should be recorded. Figures AM1-I and AM1-II are examples of logbook forms that may be used to record this type of data. Magnetic tape or paper tape may also be used to record data.

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LIDAR LOG CONTROL NUMBER TABULATION

Log Book Number-_____

(Assign a CONTROL NUMBER to each individual source under test)

CONTROL NUMBER	DATE ASSIGNED	PROJECT	CITY, STATE

continued on next page

LIDAR LOG CONTROL NUMBER TABULATION (cont'd)

(Assign a CONTROL NUMBER to each individual source under test)

CONTROL NUMBER	DATE ASSIGNED	PROJECT	CITY, STATE

Next Log Book Number-_____

Figure AM1-1 Lidar Log Control Number Tabulation

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LIDAR LOG OF OPERATIONS

Control number: OWLS-_____

Facility name and location:

At the field site on / / from _____ to _____ (local time)
Location of LIDAR:

Direction to source _____ Range to source _____ km
Laser inclination = angle of up horizontal is 0 _____
Source type and official designation:

Plume characteristics (color, shape, steam present, etc.)

Wind speed: begin _____ km hr end _____ km hr Wind direction: begin _____ end _____
Air temperature: begin _____ C end _____ C Relative humidity: begin _____ %, end _____ %
Barometer: begin _____ end _____ Visibility: begin _____ km end _____ km
Cloud cover: begin _____ end _____

Data records made in field (tapes, printouts, photos, etc.)

MAGNETIC TAPES		
tape #	track #	files

OPERATOR'S SIGNATURE: _____ DATE: _____

WITNESS SIGNATURE: _____ DATE: _____

LIDAR OPERATOR'S NOTES

(Include position of laser beam within plume-- attached plume, etc.)

LIDAR FUNCTION VERIFICATION Source: optical generator [ ] screens [ ]

Date of last calibration _____ This test recorded on tape # _____ track # _____

	1	2	3	4	5	6	7	8
Calibrated opacity								
Calculated opacity								
Recorded on file								

OPERATOR'S SIGNATURE: _____ DATE: _____

WITNESS SIGNATURE: _____ DATE: _____

Figure AM1-II Lidar Log Of Operations

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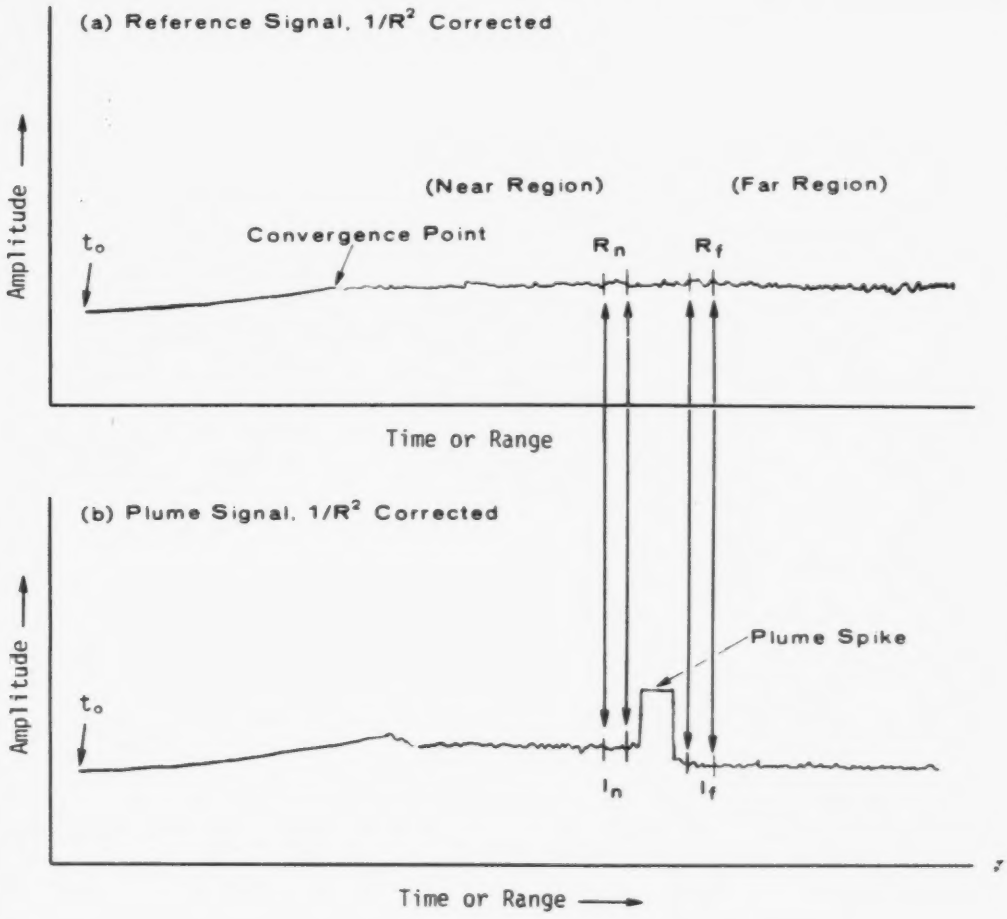

(a) Reference signal, $1/R^2$-corrected. This reference signal is for plume signal (b). R_n, R_f are chosen to coincide with I_n, I_f.

(b) Plume signal, $1/R^2$-corrected. The plume spike and the decrease in the backscatter signal amplitude in the far region are due to the opacity of the plume. I_n, I_f are chosen as indicated in Section 2.6.

Figure AM1-III. Plots of Lidar Backscatter Signals

2.6 Opacity Calculation and Data Analysis. Referring to the reference signal and plume signal in Figure AM1-III, the measured opacity (O_p) in percent for each lidar measurement is calculated using Equation AM1-2. ($O_p = 1 - T_p$; T_p is the plume transmittance.)

$$O_p = (100\%) \left[1 - \left(\frac{I_f}{R_f} \frac{R_n}{I_n} \right)^{\frac{1}{2}} \right] , \quad \text{(AM1-2)}$$

where:

I_n = near-region pick interval signal amplitude, plume signal, $1/R^2$ corrected,

I_f = far-region pick interval signal amplitude, plume signal, $1/R^2$ corrected,

R_n = near-region pick interval signal amplitude, reference signal, $1/R^2$ corrected, and

R_f = far-region pick interval signal amplitude, reference signal, $1/R^2$ corrected.

The $1/R^2$ correction to the plume and reference signal amplitudes is made by multiplying the amplitude for each successive sample interval from the time reference, by the square of the lidar time (or range) associated with that sample interval [Reference 5.1].

The first step in selecting the pick intervals for Equation AM1-2 is to divide the plume signal amplitude by the reference signal amplitude at the same respective ranges to obtain a "normalized" signal. The pick intervals selected using this normalized signal, are a minimum of 15 m (100 nanoseconds) in length and consist of at least 5 contiguous sample intervals. In addition, the following criteria, listed in order of importance, govern pick interval selection. (1) The intervals shall be in a region of the normalized signal where the reference signal meets the requirements of Section 2.3 and is everywhere greater than zero. (2) The intervals (near and far) with the minimum average amplitude are chosen. (3) If more than one interval with the same minimum average amplitude is found, the interval closest to the plume is chosen. (4) The standard deviation, S_o, for the calculated opacity shall be 8% or less. (S_o is calculated by Equation AM1-7).

If S_o is greater than 8%, then the far pick interval shall be changed to the next interval of minimal average amplitude. If S_o is still greater than 8%, then this procedure is repeated for the far pick interval. This procedure may be repeated once again for the near pick interval, but if S_o remains greater than 8%, the plume signal shall be discarded.

The reference signal pick intervals, R_n and R_f, must be chosen over the same time interval as the plume signal pick intervals, I_n and I_f, respectively [Figure AM1-III]. Other methods of selecting pick intervals may be used if they give equivalent results. Field-oriented examples of pick interval selection are available in Reference 5.1.

The average amplitudes for each of the pick intervals, I_n, I_f, R_n, R_f, shall be calculated by averaging the respective individual amplitudes of the sample intervals from the plume signal and the associated reference signal each corrected for $1/R^2$. The amplitude of I_n shall be calculated according to Equation (AM-3).

$$I_n = \frac{1}{m} \sum_{i=1}^{m} I_{ni} , \quad \text{(AM1-3)}$$

where:

I_{ni} = the amplitude of the ith sample interval (near-region),

Σ = sum of the individual amplitudes for the sample intervals,

m = number of sample intervals in the pick interval, and

I_n = average amplitude of the near-region pick interval.

Similarly, the amplitudes for I_f, R_n, and R_f are calculated with the three expressions in Equation (AM1-4).

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$$I_f = \frac{1}{m} \sum_{i=1}^{m} I_{fi} \ , \quad R_n = \frac{1}{m} \sum_{i=1}^{m} R_{ni} \ , \quad R_f = \frac{1}{m} \sum_{i=1}^{m} R_{fi} \ .$$

(AM1-4)

The standard deviation, S_{In}, of the set of amplitudes for the near-region pick interval, I_n, shall be calculated using Equation (AM1-5).

$$S_{In} = \left[\sum_{i=1}^{m} \frac{(I_{ni} - I_n)^2}{(m-1)} \right]^{\frac{1}{2}} .$$

(AM1-5)

Similarly, the standard deviations S_{If}, S_{Rn}, and S_{Rf} are calculated with the three expressions in Equation (AM1-6).

$$S_{If} = \left[\sum_{i=1}^{m} \frac{(I_{fi} - I_f)^2}{(m-1)} \right]^{\frac{1}{2}} ,$$

$$S_{Rn} = \left[\sum_{i=1}^{m} \frac{(R_{ni} - R_n)^2}{(m-1)} \right]^{\frac{1}{2}} ,$$

$$S_{Rf} = \left[\sum_{i=1}^{m} \frac{(R_{fi} - R_f)^2}{(m-1)} \right]^{\frac{1}{2}} .$$

(AM1-6)

The standard deviation, S_o, for each associated opacity value, O_p, shall be calculated using Equation (AM1-7).

$$S_o = \frac{(100\%)}{2}\left(\frac{I_f}{R_f}\frac{R_n}{I_n}\right)^{\frac{1}{2}}\left[\frac{S_{In}^2}{I_n^2} + \frac{S_{If}^2}{I_f^2} + \frac{S_{Rn}^2}{R_n^2} + \frac{S_{Rf}^2}{R_f^2}\right]^{\frac{1}{2}} \quad \text{(AM1-7)}$$

The calculated values of I_n, I_f, R_n, R_f, S_{In}, S_{If}, S_{Rn}, S_{Rf}, O_p, and S_o should be recorded. Any plume signal with an S_o greater than 8% shall be discarded.

2.6.1 Azimuth Angle Correction. If the azimuth angle correction to opacity specified in this section is performed, then the elevation angle correction specified in Section 2.6.2 shall not be performed. When opacity is measured in the residual region of an attached steam plume, and the lidar line-of-sight is not perpendicular to the plume, it may be necessary to correct the opacity measured by the lidar to obtain the opacity that would be measured on a path perpendicular to the plume. The following method, or any other method which produces equivalent results, shall be used to determine the need for a correction, to calculate the correction, and to document the point within the plume at which the opacity was measured.

Figure AM1-IV(b) shows the geometry of the opacity correction. L' is the path through the plume along which the opacity measurement is made. P' is the path perpendicular to the plume at the same point. The angle ϵ is the angle between L' and the plume center line. The angle ($\bullet/2-\epsilon$), is the angle between the L' and P'. The measured opacity, O_p, measured along the path L' shall be corrected to obtain the corrected opacity, O_{pc}, for the path P', using Equation (AM1-8).

$$O_{pc} = (100\%)\left[1 - (1 - 0.01\,O_p)^{\text{Cos}\,(\pi/2-\varepsilon)}\right]$$

$$= (100\%)\left[1 - (1 - 0.01\,O_p)^{\text{Sin}\,\varepsilon}\right] \quad \text{(AM1-8)}$$

The correction in Equation (AM1-8) shall be performed if the inequality in Equation (AM1-9) is true.

$$\varepsilon \geq \text{Sin}^{-1}\left[\frac{\ln\,(101 - O_p)}{\ln\,(100 - O_p)}\right] \quad \text{(AM1-9)}$$

Figure AM1-IV(a) shows the geometry used to calculate ϵ and the position in the plume at which the lidar measurement is made. This analysis assumes that for a given lidar measurement, the range from the lidar to the plume, the elevation angle of the lidar from the horizontal plane, and the azimuth angle of the lidar from an arbitrary fixed reference in the horizontal plane can all be obtained directly.

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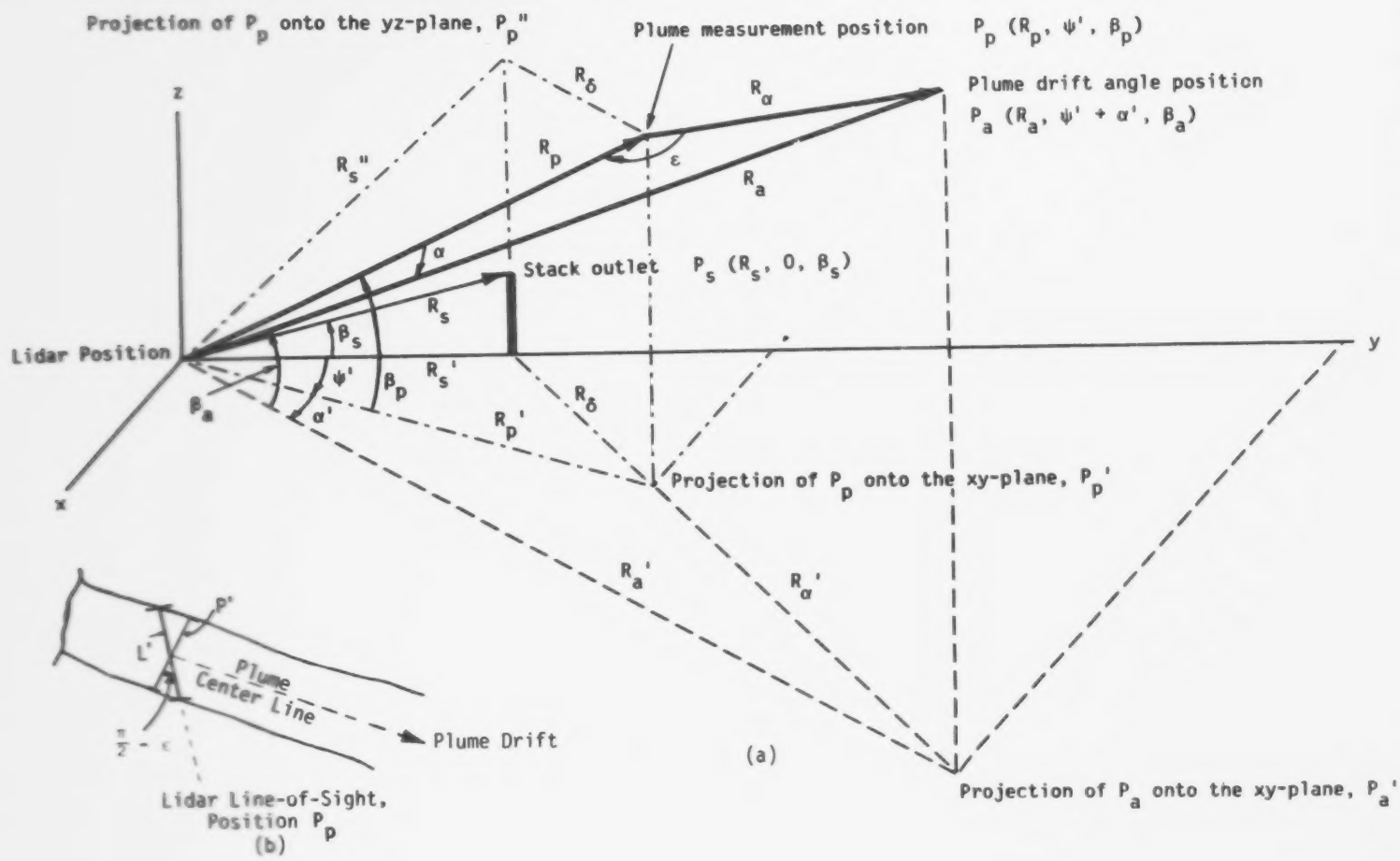

Figure AMI - IV. Correction in Opacity for Drift of the Residual Region of an Attached Steam Plume.

R_s=range from lidar to source*
β_s=elevation angle of R_s*
R_p=range from lidar to plume at the opacity measurement point*
β_p=elevation angle of R_p*
R_a=range from lidar to plume at some arbitrary point, P_a, so the drift angle of the plume can be determined*
β_a=elevation angle of R_a*
α=angle between R_p and R_a
R'_s=projection of R_s in the horizontal plane
R'_p=projection of R_p in the horizontal plane
R'_a=projection of R_a in the horizontal plane
ψ'=angle between R'_s and R'_p*
α'=angle between R'_p and R'_a*
$R\leqq$=distance from the source to the opacity measurement point projected in the horizontal plane
$R\theta$=distance from opacity measurement point P_p to the point in the plume P_a.

$$O_{pc} = 1 - (1 - O_p)^{\mathrm{Cos}\ (\pi/2-\varepsilon)} = 1 - (1 - O_p)^{\mathrm{Sin}\ \varepsilon} \qquad \text{(AMI-8)}$$

The correction angle ϵ shall be determined using Equation AM1-10.
where:
$\alpha = \mathrm{Cos}^{-1}(\mathrm{Cos}\beta_p\ \mathrm{Cos}\beta_a\ \mathrm{Cos}\alpha' + \mathrm{Sin}\beta_p\ \mathrm{Sin}\beta_a)$,
and

$R\theta = (R_p^2 + R_a^2 - 2\ R_p\ R_a\ \mathrm{Cos}\alpha)^{1/2}$

$R\leqq$, the distance from the source to the opacity measurement point projected in the horizontal plane, shall be determined using Equation AM1-11.

$$R_\delta = (R'^2_s + R'^2_p - 2R'_sR'_p\mathrm{Cos}\psi')^{\frac{1}{2}}, \qquad \text{(AM1-11)}$$

where:
$R'_s = R_s\ \mathrm{Cos}\ \beta_s$, and
$R'_p = R_p\ \mathrm{Cos}\ \beta_p$.

In the special case where the plume centerline at the opacity measurement point is horizontal, parallel to the ground, Equation AM1-12 may be used to determine ϵ instead of Equation AM1-10.

$$\varepsilon = \mathrm{Cos}^{-1}\left[\frac{R_p^2 + R_\delta^2 - R''^2_s}{2\ R_p\ R_\delta}\right] \qquad \text{(AM1-12)}$$

where:
$R''_s = (R'^2_s + R_p^2\ \mathrm{Sin}^2\beta_p)^{1/2}$.

If the angle ϵ is such that $\epsilon < 30°$ or $\epsilon > 150°$, the azimuth angle correction shall not be performed and the associated opacity value shall be discarded.

2.6.2 Elevation Angle Correction. An individual lidar-measured opacity, O_p, shall be corrected for elevation angle if the laser elevation or inclination angle, β_p [Figure AM1-V], is greater than or equal to the value calculated in Equation AM1-13.

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$$\beta_p \geq \text{Cos}^{-1} \left[\frac{\ln (101 - O_p)}{\ln (100 - O_p)} \right] \qquad \text{(AM1-13)}$$

The measured opacity, O_p, along the lidar path L, is adjusted to obtain the corrected opacity, O_{pc}, for the actual plume (horizontal) path, P, by using Equation (AM1-14).

$$O_{pc} = (100\%) \left[1 - (1 - 0.01\, O_p)^{\text{Cos}\beta_p} \right], \qquad \text{(AM1-14)}$$

where:

β_p=lidar elevation or inclination angle,
O_p=measured opacity along path L, and
O_{pc}=corrected opacity for the actual plume thickness P.

The values for β_p, O_p and O_{pc} should be recorded.

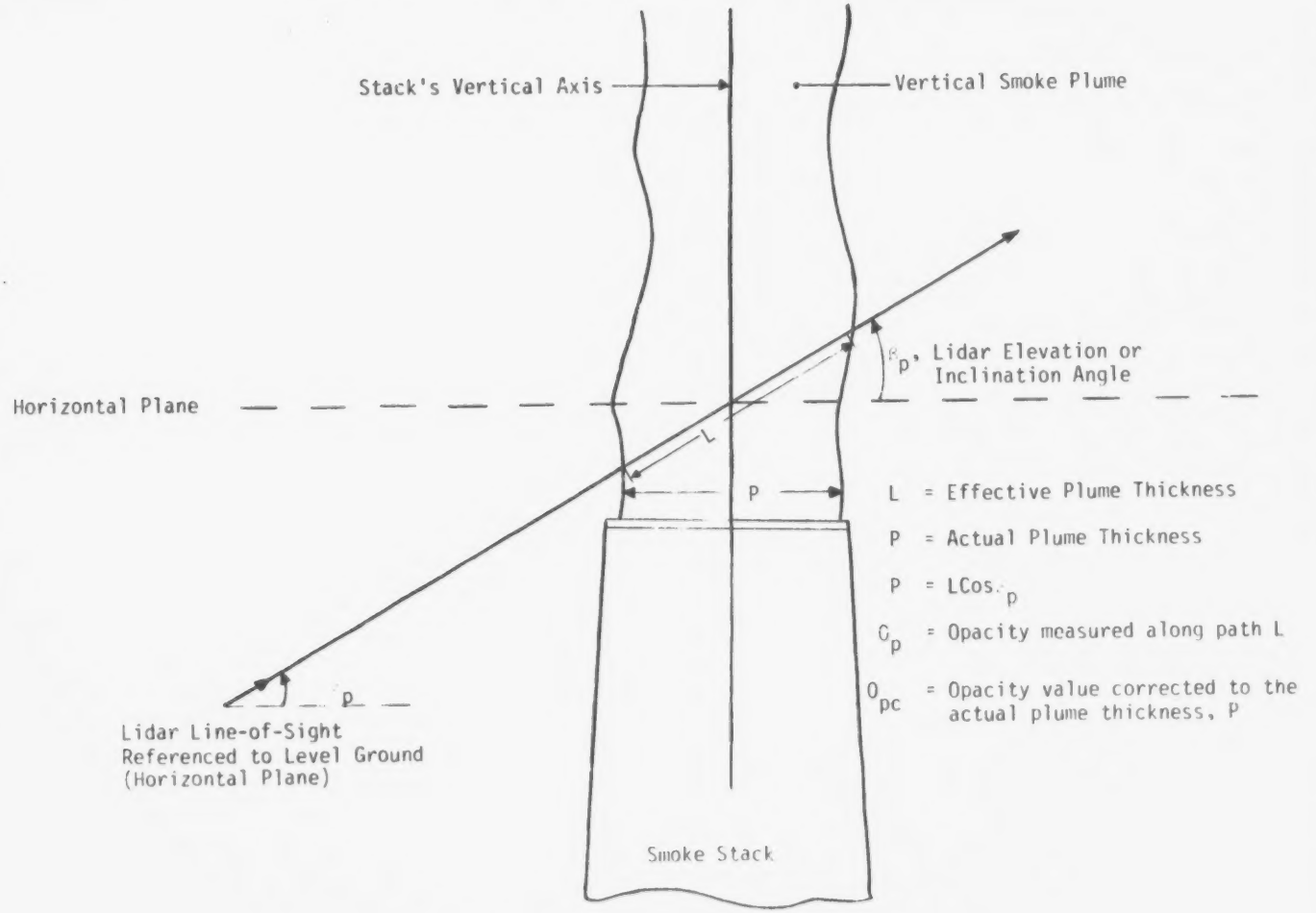

Figure AM1-V. Elevation Angle Correction for Vertical Plumes.

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2.6.3 Determination of Actual Plume Opacity. Actual opacity of the plume shall be determined by Equation AM1-15.

$$O_{pa} = O_{pc} - [2\,S_o + 5\%]. \qquad \text{(AM1-15)}$$

2.6.4 Calculation of Average Actual Plume Opacity. The average of the actual plume opacity, $\bar{O}_{pa}$, shall be calculated as the average of the consecutive individual actual opacity values, $\bar{O}_{pa}$, by Equation AM1-16.

$$\bar{O}_{pa} = \frac{1}{n}\sum_{k=1}^{n}(O_{pa})_k\,, \qquad \text{(AM1-16)}$$

where:

$(O_{pa})_k$=the kth actual opacity value in an averaging interval containing n opacity values; k is a summing index.

Σ=the sum of the individual actual opacity values.

n=the number of individual actual opacity values contained in the averaging interval.

$\bar{O}_{pa}$=average actual opacity calculated over the averaging interval.

3. Lidar Performance Verification. The lidar shall be subjected to two types of performance verifications that shall be performed in the field. The annual calibration, conducted at least once a year, shall be used to directly verify operation and performance of the entire lidar system. The routine verification, conducted for each emission source measured, shall be used to insure proper performance of the optical receiver and associated electronics.

3.1 Annual Calibration Procedures. Either a plume from a smoke generator or screen targets shall be used to conduct this calibration.

If the screen target method is selected, five screens shall be fabricated by placing an opaque mesh material over a narrow frame (wood, metal extrusion, etc.). The screen shall have a surface area of at least one square meter. The screen material should be chosen for precise optical opacities of about 10, 20, 40, 60, and 80%. Opacity of each target shall be optically determined and should be recorded. If a smoke generator plume is selected, it shall meet the requirements of Section 3.3 of Reference Method 9. This calibration shall be performed in the field during calm (as practical) atmospheric conditions. The lidar shall be positioned in accordance with Section 2.1.

The screen targets must be placed perpendicular to and coincident with the lidar line-of-sight at sufficient height above the ground (suggest about 30 ft) to avoid ground-level dust contamination. Reference signals shall be obtained just prior to conducting the calibration test.

The lidar shall be aimed through the center of the plume within 1 stack diameter of the exit, or through the geometric center of the screen target selected. The lidar shall be set in operation for a 6-minute data run at a nominal pulse rate of 1 pulse every 10 seconds. Each backscatter return signal and each respective opacity value obtained from the smoke generator transmissometer, shall be obtained in temporal coincidence. The data shall be analyzed and reduced in accordance with Section 2.6 of this method. This calibration shall be performed for 0% (clean air), and at least five other opacities (nominally 10, 20, 40, 60, and 80%).

The average of the lidar opacity values obtained during a 6-minute calibration run shall be calculated and should be recorded. Also the average of the opacity values obtained from the smoke generator transmissometer for the same 6-minute run shall be calculated and should be recorded.

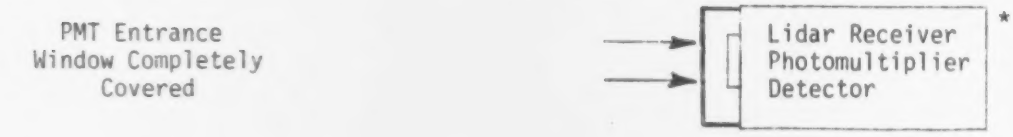
Alternate calibration procedures that do not meet the above requirements but produce equivalent results may be used.

3.2 Routine Verification Procedures. Either one of two techniques shall be used to conduct this verification. It shall be performed at least once every 4 hours for each emission source measured. The following parameters shall be directly verified.

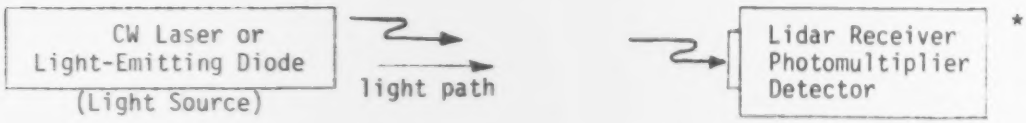
1) The opacity value of 0% plus a minimum of 5 (nominally 10, 20, 40, 60, and 80%) opacity values shall be verified through the PMT detector and data processing electronics.

2) The zero-signal level (receiver signal with no optical signal from the source present) shall be inspected to insure that no spurious noise is present in the signal. With the entire lidar receiver and analog/digital electronics turned on and adjusted for normal operating performance, the following procedures shall be used for Techniques 1 and 2, respectively.

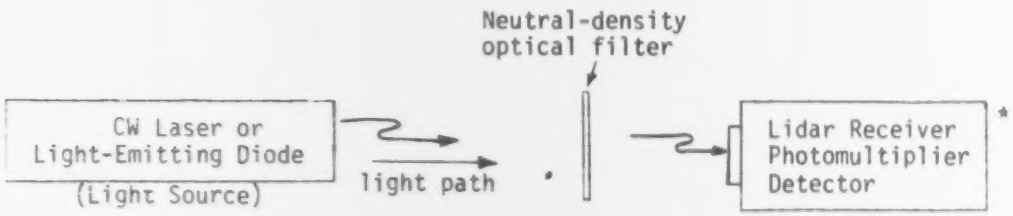
3.2.1 Procedure for Technique 1. This test shall be performed with no ambient or stray light reaching the PMT detector. The narrow band filter (694.3 nanometers peak) shall be removed from its position in front of the PMT detector. Neutral density filters of nominal opacities of 10, 20, 40, 60, and 80% shall be used. The recommended test configuration is depicted in Figure AM1-VI.



(a) Zero-Signal Level Test



(b) Clear-Air or 0% Opacity Test



(c) Optical Filter Test (simulated opacity values)

*Tests shall be performed with no ambient or stray light reaching the detector.

Figure AM1-VI. Test Configuration for Technique 1.

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The zero-signal level shall be measured and should be recorded, as indicated in Figure AM1-VI(a). This simulated clear-air or 0% opacity value shall be tested in using the selected light source depicted in Figure AM1-VI(b).

The light source either shall be a continuous wave (CW) laser with the beam mechanically chopped or a light emitting diode controlled with a pulse generator (rectangular pulse). (A laser beam may have to be attenuated so as not to saturate the PMT detector). This signal level shall be measured and should be recorded. The opacity value is calculated by taking two pick intervals [Section 2.6] about 1 microsecond apart in time and using Equation (AM1-2) setting the ratio $R_n/R_t=1$. This calculated value should be recorded.

The simulated clear-air signal level is also employed in the optical test using the neutral density filters. Using the test configuration in Figure AM1-VI(c), each neutral density filter shall be separately placed into the light path from the light source to the PMT detector. The signal level shall be measured and should be recorded. The opacity value for each filter is calculated by taking the signal level for that respective filter (I_t), dividing it by the 0% opacity signal level (I_n) and performing the remainder of the calculation by Equation (AM1-2) with $R_n/R_t=1$. The calculated opacity value for each filter should be recorded.

The neutral density filters used for Technique 1 shall be calibrated for actual opacity with accuracy of ±2% or better. This calibration shall be done monthly while the filters are in use and the calibrated values should be recorded.

3.2.2 Procedure for Technique 2. An optical generator (built-in calibration mechanism) that contains a light-emitting diode (red light for a lidar containing a ruby laser) is used. By injecting an optical signal into the lidar receiver immediately ahead of the PMT detector, a backscatter signal is simulated. With the entire lidar receiver electronics turned on and adjusted for normal operating performance, the optical generator is turned on and the simulation signal (corrected for $1/R^2$) is selected with no plume spike signal and with the opacity value equal to 0%. This simulated clear-air atmospheric return signal is displayed on the system's video display. The lidar operator then makes any fine adjustments that may be necessary to maintain the system's normal operating range.

The opacity values of 0% and the other five values are selected one at a time in any order. The simulated return signal data should be recorded. The opacity value shall be calculated. This measurement/calculation shall be performed at least three times for each selected opacity value. While the order is not important, each of the opacity values from the optical generator shall be verified. The calibrated optical generator opacity value for each selection should be recorded.

The optical generator used for Technique 2 shall be calibrated for actual opacity with an accuracy of ±1% or better. This calibration shall be done monthly while the generator is in use and calibrated value should be recorded.

Alternate verification procedures that do not meet the above requirements but produce equivalent results may be used.

3.3 Deviation. The permissible error for the annual calibration and routine verification are:

3.3.1 Annual Calibration Deviation.

3.3.1.1 Smoke Generator. If the lidar-measured average opacity for each data run is not within ±5% (full scale) of the respective smoke generator's average opacity over the range of 0% through 80%, then the lidar shall be considered out of calibration.

3.3.1.2 Screens. If the lidar-measured average opacity for each data run is not within ±3% (full scale) of the laboratory-determined opacity for each respective simulation screen target over the range of 0% through 80%, then the lidar shall be considered out of calibration.

3.3.2 Routine Verification Error. If the lidar-measured average opacity for each neutral density filter (Technique 1) or optical generator selection (Technique 2) is not within ±3% (full scale) of the respective laboratory calibration value then the lidar shall be considered non-operational.

4. Performance/Design Specification for Basic Lidar System.

4.1 Lidar Design Specification. The essential components of the basic lidar system are a pulsed laser (transmitter), optical receiver, detector, signal processor, recorder, and an aiming device that is used in aiming the lidar transmitter and receiver. Figure AM1-VII shows a functional block diagram of a basic lidar system.

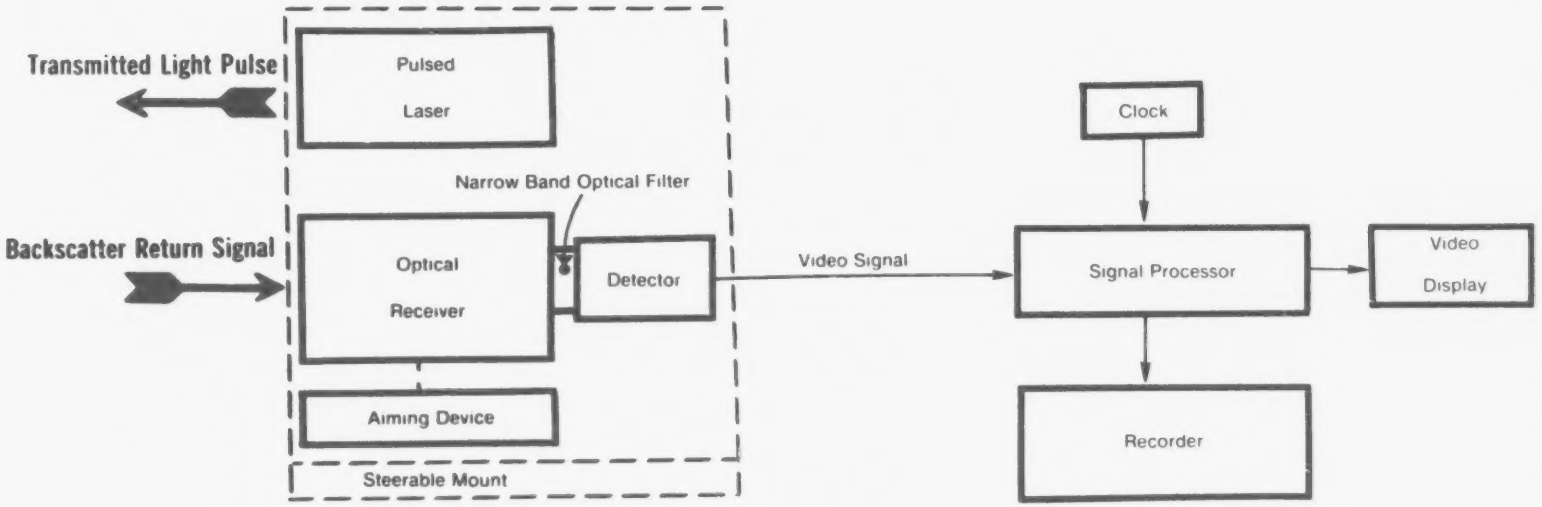

Figure AM1-VII. Functional Block Diagram of a Basic Lidar System

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4.2 Performance Evaluation Tests. The owner of a lidar system shall subject such a lidar system to the performance verification tests described in Section 3, prior to first use of this method. The annual calibration shall be performed for three separate, complete runs and the results of each should be recorded. The requirements of Section 3.3.1 must be fulfilled for each of the three runs.

Once the conditions of the annual calibration are fulfilled the lidar shall be subjected to the routine verification for three separate complete runs. The requirements of Section 3.3.2 must be fulfilled for each of the three runs and the results should be recorded. The Administrator may request that the results of the performance evaluation be submitted for review.

5. References.

5.1 The Use of Lidar for Emissions Source Opacity Determination, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO, EPA-330/1-79-003-R, Arthur W. Dybdahl, current edition [NTIS No. PB81-246662].

5.2 Field Evaluation of Mobile Lidar for the Measurement of Smoke Plume Opacity, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO, EPA/NEIC-TS-128, February 1976.

5.3 Remote Measurement of Smoke Plume Transmittance Using Lidar, C. S. Cook, G. W. Bethke, W. D. Conner (EPA/RTP). Applied Optics 11, pg 1742, August 1972.

5.4 Lidar Studies of Stack Plumes in Rural and Urban Environments, EPA-650/4-73-002, October 1973.

5.5 American National Standard for the Safe Use of Lasers ANSI Z 136.1-176, 8 March 1976.

5.6 U.S. Army Technical Manual TB MED 279, Control of Hazards to Health from Laser Radiation, February 1969.

5.7 Laser Institute of America Laser Safety Manual, 4th Edition.

5.8 U.S. Department of Health, Education and Welfare, Regulations for the Administration and Enforcement of the Radiation Control for Health and Safety Act of 1968, January 1976.

5.9 Laser Safety Handbook, Alex Mallow, Leon Chabot, Van Nostrand Reinhold Co., 1978.

Method 10—Determination of Carbon Monoxide Emissions From Stationary Sources

1. *Principle and Applicability.*

1.1 *Principle.* An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 *Applicability.* This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. *Range and sensitivity.*

2.1 *Range.* 0 to 1,000 ppm.

2.2 *Sensitivity.* Minimum detectable concentration is 20 ppm for a 0 to 1,000 ppm span.

3. *Interferences.* Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 ppm CO and 10 percent CO_2 per 10 ppm CO, respectively, for devices measuring in the 1,500 to 3,000 ppm range. For devices measuring in the 0 to 100 ppm range, interference ratios can be as high as 3.5 percent H_2O per 25 ppm CO and 10 percent CO_2 per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. *Precision and accuracy.*

4.1 *Precision.* The precision of most NDIR analyzers is approximately ±2 percent of span.

4.2 *Accuracy.* The accuracy of most NDIR analyzers is approximately ±5 percent of span after calibration.

5. *Apparatus.*

5.1 *Continuous sample* (Figure 10-1).

5.1.1 *Probe.* Stainless steel or sheathed Pyrex[1] glass, equipped with a filter to remove particulate matter.

5.1.2 *Air-cooled condenser or equivalent.* To remove any excess moisture.

5.2 *Integrated sample* (Figure 10-2).

5.2.1 *Probe.* Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 *Air-cooled condenser or equivalent.* To remove any excess moisture.

5.2.3 *Valve.* Needle valve, or equivalent, to to adjust flow rate.

5.2.4 *Pump.* Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 *Rate meter.* Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min. (0.035 cfm).

5.2.6 *Flexible bag.* Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation

[1]Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

is complete, there should be no flow through the meter.

5.2.7 *Pitot tube.* Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 *Analysis* (Figure 10-3).

5.3.1 *Carbon monoxide analyzer.* Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 *Drying tube.* To contain approximately 200 g of silica gel.

5.3.3 *Calibration gas.* Refer to paragraph 6.1.

5.3.4 *Filter.* As recommended by NDIR manufacturer

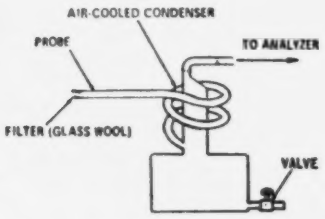

Figure 10-1. Continuous sampling train.

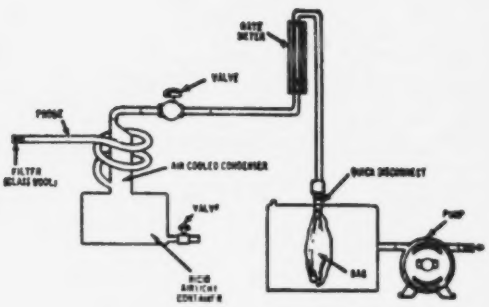

Figure 10-2. Integrated gas-sampling train.

5.3.5 CO_2 removal tube. To contain approximately 500 g of ascarite.

5.3.6 *Ice water bath.* For ascarite and silica gel tubes.

5.3.7 *Valve.* Needle valve, or equivalent, to adjust flow rate

5.3.8 *Rate meter.* Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min. (0.035 cfm) through NDIR.

5.3.9 *Recorder (optional).* To provide permanent record of NDIR readings.

6. *Reagents.*

6.1 *Calibration gases.* Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ±2 percent of the specified concentration.

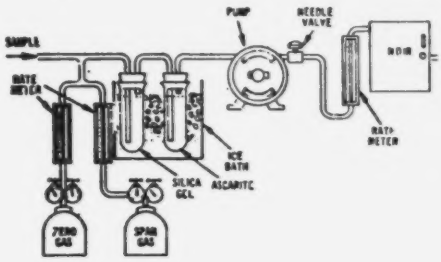

Figure 10-3. Analytical equipment.

6.2 *Silica gel.* Indicating type, 6 to 16 mesh, dried at 175° C (347° F) for 2 hours.

6.3 *Ascarite.* Commercially available.

7. *Procedure.*

7.1 *Sampling.*

7.1.1 *Continuous sampling.* Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See ¶ 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure (36 FR 24886), or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 *Integrated sampling.* Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures (36 FR 24886), or by weighing the ascarite CO_2 removal tube and comput-

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ing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.2 *CO Analysis.* Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in paragraph 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. *Calibration.* Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

TABLE 10-1—FIELD DATA

	Comments
Location	
Test	
Date	
Operator	

Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. *Calculation—Concentration of carbon monoxide.* Calculate the concentration of carbon monoxide in the stack using equation 10-1.

$$C_{CO\ stack} = C_{CO\ NDIR}(1 - F_{CO_2})$$

where:

$C_{CO\ stack}$ = concentration of CO in stack, ppm by volume (dry basis).

$C_{CO\ NDIR}$ = concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

F_{CO_2} = volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

10. *Bibliography.*

10.1 McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, Calif., April 1, 1970.

10.2 Jacobs, M. B., et al., Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer, J. Air Pollution Control Association, 9(2): 110-114, August 1959.

10.3 MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, Pa.

10.4 Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, Calif., October 1967.

10.5 Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, N.J.

10.6 UNOR Infrared Gas Analyzers, Bendix Corp., Ronceverte, West Virginia.

ADDENDA—A. PERFORMANCE SPECIFICATIONS FOR NDIR CARBON MONOXIDE ANALYZERS.

Range (minimum)	0-1000 ppm.
Output (minimum)	0-10mV.
Minimum detectable sensitivity.	20 ppm.
Rise time, 90 percent (maximum).	30 seconds.
Fall time, 90 percent (maximum).	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision (minimum)	±2% of full scale.
Noise (maximum)	±1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Interference rejection ratio	CO_2—1000 to 1, H_2O—500 to 1.

B. *Definitions of Performance Specifications.*

Range—The minimum and maximum measurement limits.

Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale—The maximum measuring limit for a given range.

Minimum detectable sensitivity—The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy—The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.

Time to 90 percent response—The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.

Rise Time (90 percent)—The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.

Fall Time (90 percent)—The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.

Zero Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.

Span Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.

Precision—The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.

Noise—Spontaneous deviations from a mean output not caused by input concentration changes.

Linearity—The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 11—Determination of Hydrogen Sulfide Content of Fuel Gas Streams in Petroleum Refineries

1. *Principle and applicability.* 1.1 *Principle.* Hydrogen sulfide (H_2S) is collected from a source in a series of midget impingers and absorbed in pH 3.0 cadmium sulfate ($CdSO_4$) solution to form cadmium sulfide (CdS). The latter compound is then measured iodometrically. An impinger containing hydrogen peroxide is included to remove SO_2 as an interfering species. This method is a revision of the H_2S method originally published in the Federal Register, Volume 39, No. 47, dated Friday, March 8, 1974.

1.2 *Applicability.* This method is applicable for the determination of the hydrogen sulfide content of fuel gas streams at petroleum refineries.

2. *Range and sensitivity.* The lower limit of detection is approximately 8 mg/m³ (6 ppm). The maximum of the range is 740 mg/m³ (520 ppm).

3. *Interferences.* Any compound that reduces iodine or oxidizes iodide ion will interfere in this procedure, provided it is collected in the cadmium sulfate impingers. Sulfur dioxide in concentrations of up to 2,600 mg/m³ is eliminated by the hydrogen peroxide solution. Thiols precipitate with hydrogen sulfide. In the absence of H_2S, only co-traces of thiols are collected. When methane- and ethane-thiols at a total level of 300 mg/m³ are present in addition to H_2S, the results vary from 2 percent low at an H_2S concentration of 400 mg/m³ to 14 percent high at an H_2S concentration of 100 mg/m³. Carbon oxysulfide at a concentration of 20 percent does not interfere. Certain carbonyl-containing compounds react with iodine and produce recurring end points. However, acetaldehyde and acetone at concentrations of 1 and 3 percent, respectively, do not interfere.

Entrained hydrogen peroxide produces a negative interference equivalent to 100 percent of that of an equimolar quantity of hydrogen sulfide. Avoid the ejection of hydrogen peroxide into the cadmium sulfate impingers.

4. *Precision and accuracy.* Collaborative testing has shown the within-laboratory coefficient of variation to be 2.2 percent and the overall coefficient of variation to be 5 percent. The method bias was shown to be −4.8 percent when only H_2S was present. In the presence of the interferences cited in section 3, the bias was positive at low H_2S concentration and negative at higher concentrations. At 230 mg H_2S/m³, the level of the compliance standard, the bias was +2.7 percent. Thiols had no effect on the precision.

5. *Apparatus.*

5.1 Sampling apparatus.

5.1.1 Sampling line. Six to 7 mm (¼ in.) Teflon[1] tubing to connect the sampling train to the sampling valve.

5.1.2 Impingers. Five midget impingers, each with 30 ml capacity. The internal diameter of the impinger tip must be 1 mm ±0.05 mm. The impinger tip must be positioned 4 to 6 mm from the bottom of the impinger.

5.1.3 Glass or Teflon connecting tubing for the impingers.

5.1.4 Ice bath container. To maintain absorbing solution at a low temperature.

5.1.5 Drying tube. Tube packed with 6- to 16-mesh indicating-type silica gel, or equivalent, to dry the gas sample and protect the meter and pump. If the silica gel has been used previously, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to approval of the Administrator.

Note: Do not use more than 30 g of silica gel. Silica gel absorbs gases such as propane from the fuel gas stream, and use of excessive amounts of silica gel could result in errors in the determination of sample volume.

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[1]Mention of trade names of specific products does not constitute endorsement by the Environmental Protection Agency.

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5.1.6 Sampling valve. Needle valve or equivalent to adjust gas flow rate. Stainless steel or other corrosion-resistant material.

5.1.7 Volume meter. Dry gas meter, sufficiently accurate to measure the sample volume within 2 percent, calibrated at the selected flow rate (~1.0 liter/min) and conditions actually encountered during sampling. The meter shall be equipped with a temperature gauge (dial thermometer or equivalent) capable of measuring temperature to within 3° C (5.4° F). The gas meter should have a petcock, or equivalent, on the outlet connector which can be closed during the leak check. Gas volume for one revolution of the meter must not be more than 10 liters.

5.1.8 Flow meter. Rotameter or equivalent, to measure flow rates in the range from 0.5 to 2 liters/min (1 to 4 cfh).

5.1.9 Graduated cylinder, 25 ml size.

5.1.10 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case, the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice-versa for elevation decrease.

5.1.11 U-tube manometer. 0–30 cm water column. For leak check procedure.

5.1.12 Rubber squeeze bulb. To pressurize train for leak check.

5.1.13 Tee, pinchclamp, and connecting tubing. For leak check.

5.1.14 Pump. Diaphragm pump, or equivalent. Insert a small surge tank between the pump and rate meter to eliminate the pulsation effect of the diaphragm pump on the rotameter. The pump is used for the air purge at the end of the sample run; the pump is not ordinarily used during sampling, because fuel gas streams are usually sufficiently pressurized to force sample gas through the train at the required flow rate. The pump need not be leak-free unless it is used for sampling.

5.1.15 Needle valve or critical orifice. To set air purge flow to 1 liter/min.

5.1.16 Tube packed with active carbon. To filter air during purge.

5.1.17 Volumetric flask. One 1,000 ml.

5.1.18 Volumetric pipette. One 15 ml.

5.1.19 Pressure-reduction regulator. Depending on the sampling stream pressure, a pressure-reduction regulator may be needed to reduce the pressure of the gas stream entering the Teflon sample line to a safe level.

5.1.20 Cold trap. If condensed water or amine is present in the sample stream, a corrosion-resistant cold trap shall be used immediately after the sample tap. The trap shall not be operated below 0° C (32° F) to avoid condensation of C_3 or C_4 hydrocarbons.

5.2 Sample recovery.

5.2.1 Sample container. Iodine flask, glass-stoppered: 500 ml size.

5.2.2 Pipette. 50 ml volumetric type.

5.2.3 Graduated cylinders. One each 25 and 250 ml.

5.2.4 Flasks. 125 ml, Erlenmeyer.

5.2.5 Wash bottle.

5.2.6 Volumetric flasks. Three 1,000 ml.

5.3 Analysis.

5.3.1 Flask. 500 ml glass-stoppered iodine flask.

5.3.2 Burette. 50 ml.

5.3.3 Flask. 125 ml, Erlenmeyer.

5.3.4 Pipettes, volumetric. One 25 ml; two each 50 and 100 ml.

5.3.5 Volumetric flasks. One 1,000 ml; two 500 ml.

5.3.6 Graduated cylinders. One each 10 and 100 ml.

6. *Reagents.* Unless otherwise indicated, it is intended that all reagents conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Otherwise, use best available grade.

6.1 Sampling.

6.1.1 Cadmium sulfate absorbing solution. Dissolve 41 g of $3CdSO_4 \cdot 8H_2O$ and 15 ml of 0.1 M sulfuric acid in a 1-liter volumetric flask that contains approximately ¾ liter of deionized distilled water. Dilute to volume with deionized water. Mix thoroughly. pH should be 3±0.1. Add 10 drops of Dow-Corning Antifoam B. Shake well before use. If Antifoam B is not used, the alternate acidified iodine extraction procedure (section 7.2.2) must be used.

6.1.2 Hydrogen peroxide, 3 percent. Dilute 30 percent hydrogen peroxide to 3 percent as needed. Prepare fresh daily.

6.1.3 Water. Deionized, distilled to conform to ASTM specifications D1193-72, Type 3. At the option of the analyst, the $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

6.2 Sample recovery.

6.2.1 Hydrochloric acid solution (HCl), 3M. Add 240 ml of concentrated HCl (specific gravity 1.19) to 500 ml of deionized, distilled water in a 1-liter volumetric flask. Dilute to 1 liter with deionized water. Mix thoroughly.

6.2.2 Iodine solution 0.1 N. Dissolve 24 g of potassium iodide (KI) in 30 ml of deionized, distilled water. Add 12.7 g of resublimed iodine (I_2) to the potassium iodide solution. Shake the mixture until the iodine is completely dissolved. If possible, let the so-

lution stand overnight in the dark. Slowly dilute the solution to 1 liter with deionized, distilled water, with swirling. Filter the solution if it is cloudy. Store solution in a brown-glass reagent bottle.

6.2.3 Standard iodine solution, 0.01 N. Pipette 100.0 ml of the 0.1 N iodine solution into a 1-liter volumetric flask and dilute to volume with deionized, distilled water. Standardize daily as in section 8.1.1. This solution must be protected from light. Reagent bottles and flasks must be kept tightly stoppered.

6.3 Analysis.

6.3.1 Sodium thiosulfate solution, standard 0.1 N. Dissolve 24.8 g of sodium thiosulfate pentahydrate ($Na_2S_2O_3 \cdot 5H_2O$) or 15.8 g of anhydrous sodium thiosulfate ($Na_2S_2O_3$) in 1 liter of deionized, distilled water and add 0.01 g of anhydrous sodium carbonate (Na_2CO_3) and 0.4 ml of chloroform ($CHCl_3$) to stabilize. Mix thoroughly by shaking or by aerating with nitrogen for approximately 15 minutes and store in a glass-stoppered, reagent bottle. Standardize as in section 8.1.2.

6.3.2 Sodium thiosulfate solution, standard 0.01 N. Pipette 50.0 ml of the standard 0.1 N thiosulfate solution into a volumetric flask and dilute to 500 ml with distilled water.

NOTE: A 0.01 N phenylarsine oxide solution may be prepared instead of 0.01 N thiosulfate (see section 6.3.3).

6.3.3 Phenylarsine oxide solution, standard 0.01 N. Dissolve 1.80 g of phenylarsine oxide (C_6H_5AsD) in 150 ml of 0.3 N sodium hydroxide. After settling, decant 140 ml of this solution into 800 ml of distilled water. Bring the solution to pH 6–7 with 6N hydrochloric acid and dilute to 1 liter. Standardize as in section 8.1.3.

6.3.4 Starch indicator solution. Suspend 10 g of soluble starch in 100 ml of deionized, distilled water and add 15 g of potassium hydroxide (KOH) pellets. Stir until dissolved, dilute with 900 ml of deionized distilled water and let stand for 1 hour. Neutralize the alkali with concentrated hydrochloric acid, using an indicator paper similar to Alkacid test ribbon, then add 2 ml of glacial acetic acid as a preservative.

NOTE: Test starch indicator solution for decomposition by titrating, with 0.01 N iodine solution, 4 ml of starch solution in 200 ml of distilled water that contains 1 g potassium iodide. If more than 4 drops of the 0.01 N iodine solution are required to obtain the blue color, a fresh solution must be prepared.

7. *Procedure.*

7.1 Sampling.

7.1.1 Assemble the sampling train as shown in figure 11-1, connecting the five midget impingers in series. Place 15 ml of 3 percent hydrogen peroxide solution in the first impinger. Leave the second impinger empty. Place 15 ml of the cadmium sulfate absorbing solution in the third, fourth, and fifth impingers. Place the impinger assembly in an ice bath container and place crushed ice around the impingers. Add more ice during the run, if needed.

7.1.2 Connect the rubber bulb and manometer to first impinger, as shown in figure 11-1. Close the petcock on the dry gas meter outlet. Pressurize the train to 25-cm water pressure with the bulb and close off tubing connected to rubber bulb. The train must hold a 25-cm water pressure with not more than a 1-cm drop in pressure in a 1-minute interval. Stopcock grease is acceptable for sealing ground glass joints.

NOTE: This leak check procedure is optional at the beginning of the sample run, but is mandatory at the conclusion. Note also that if the pump is used for sampling, it is recommended (but not required) that the pump be leak-checked separately, using a method consistent with the leak-check procedure for diaphragm pumps outlined in section 4.1.2 of reference method 6, 40 CFR Part 60, Appendix A.

7.1.3 Purge the connecting line between the sampling valve and first impinger, by disconnecting the line from the first impinger, opening the sampling valve, and allowing process gas to flow through the line for a minute or two. Then, close the sampling valve and reconnect the line to the impinger train. Open the petcock on the dry gas meter outlet. Record the initial dry gas meter reading.

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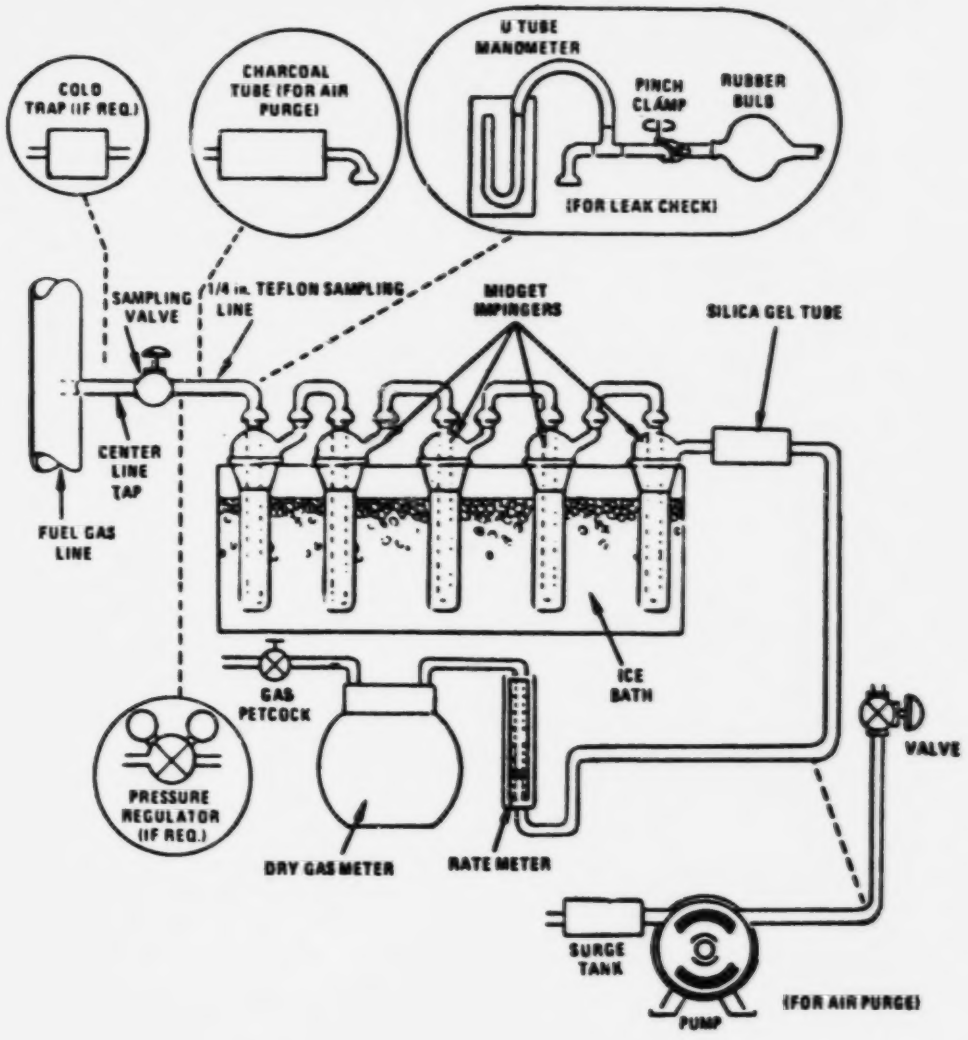

Figure 11-1. H_2S sampling train.

7.1.4 Open the sampling valve and then adjust the valve to obtain a rate of approximately 1 liter/min. Maintain a constant (±10 percent) flow rate during the test. Record the meter temperature.

7.1.5 Sample for at least 10 min. At the end of the sampling time, close the sampling valve and record the final volume and temperature readings. Conduct a leak check as described in Section 7.1.2 above.

7.1.6 Disconnect the impinger train from the sampling line. Connect the charcoal tube and the pump, as shown in figure 11-1. Purge the train (at a rate of 1 liter/min) with clean ambient air for 15 minutes to ensure that all H_2S is removed from the hydrogen peroxide. For sample recovery, cap the open ends and remove the impinger train to a clean area that is away from sources of heat. The area should be well lighted, but not exposed to direct sunlight.

7.2 Sample recovery.

7.2.1 Discard the contents of the hydrogen peroxide impinger. Carefully rinse the contents of the third, fourth, and fifth impingers into a 500 ml iodine flask.

NOTE: The impingers normally have only a thin film of cadmium sulfide remaining after a water rinse. If Antifoam B was not used or if significant quantities of yellow cadmium sulfide remain in the impingers, the alternate recovery procedure described below must be used.

7.2.2 Pipette exactly 50 ml of 0.01 N iodine solution into a 125 ml Erlenmeyer flask. Add 10 ml of 3 M HCl to the solution. Quantitatively rinse the acidified iodine into the iodine flask. Stopper the flask immediately and shake briefly.

7.2.2 (Alternate). Extract the remaining cadmium sulfide from the third, fourth, and fifth impingers using the acidified iodine solution. Immediately after pouring the acidified iodine into an impinger, stopper it and shake for a few moments, then transfer the liquid to the iodine flask. Do not transfer any rinse portion from one impinger to another; transfer it directly to the iodine flask. Once the acidified iodine solution has been poured into any glassware containing cadmium sulfide, the container must be tightly stoppered at all times except when adding more solution, and this must be done as quickly and carefully as possible. After adding any acidified iodine solution to the iodine flask, allow a few minutes for absorption of the H_2S before adding any further rinses. Repeat the iodine extraction until all cadmium sulfide is removed from the impingers. Extract that part of the connecting glassware that contains visible cadmium sulfide.

Quantitatively rinse all of the iodine from the impingers, connectors, and the beaker into the iodine flask using deionized, distilled water. Stopper the flask and shake briefly.

7.2.3 Allow the iodine flask to stand about 30 minutes in the dark for absorption of the H_2S into the iodine, then complete the titration analysis as in section 7.3.

NOTE: Caution! Iodine evaporates from acidified iodine solutions. Samples to which acidified iodine have been added may not be stored, but must be analyzed in the time schedule stated in section 7.2.3.

7.2.4 Prepare a blank by adding 45 ml of cadmium sulfate absorbing solution to an iodine flask. Pipette exactly 50 ml of 0.01 N iodine solution into a 125-ml Erlenmeyer flask. Add 10 ml of 3 M HCl. Follow the same impinger extracting and quantitative rinsing procedure carried out in sample analysis. Stopper the flask, shake briefly, let stand 30 minutes in the dark, and titrate with the samples.

NOTE: The blank must be handled by exactly the same procedure as that used for the samples.

7.3 Analysis.

NOTE: Titration analyses should be conducted at the sample-cleanup area in order to prevent loss of iodine from the sample. Titration should never be made in direct sunlight.

7.3.1 Using 0.01 N sodium thiosulfate solution (or 0.01 N phenylarsine oxide, if applicable), rapidly titrate each sample in an iodine flask using gentle mixing, until solution is light yellow. Add 4 ml of starch indicator solution and continue titrating slowly until the blue color just disappears. Record V_{TT}, the volume of sodium thiosulfate solution used, or V_{AT}, the volume of phenylarsine oxide solution used (ml).

7.3.2 Titrate the blanks in the same manner as the samples. Run blanks each day until replicate values agree within 0.05 ml. Average the replicate titration values which agree within 0.05 ml.

8. *Calibration and standards.*

8.1 Standardizations.

8.1.1 Standardize the 0.01 N iodine solution daily as follows: Pipette 25 ml of the iodine solution into a 125 ml Erlenmeyer flask. Add 2 ml of 3 M HCl. Titrate rapidly with standard 0.01 N thiosulfate solution or with 0.01 N phenylarsine oxide until the solution is light yellow, using gentle mixing. Add four drops of starch indicator solution and continue titrating slowly until the blue color just disappears. Record V_T, the volume of thiosulfate solution used, or V_{AS}, the volume of phenylarsine oxide solution used (ml). Repeat until replicate values agree within 0.05 ml. Average the replicate titration values which agree within 0.05 ml and calculate the exact normality of the iodine solution using equation 9.3. Repeat the standardization daily.

8.1.2 Standardize the 0.1 N thiosulfate solution as follows: Oven-dry potassium dichromate ($K_2Cr_2O_7$) at 180 to 200° C (360 to 390° F). Weigh to the nearest milligram, 2 g of potassium dichromate. Transfer the dichromate to a 500 ml volumetric flask, dissolve in deionized, distilled water and dilute to exactly 500 ml. In a 500 ml iodine flask, dissolve approximately 3 g of potassium iodide (KI) in 45 ml of deionized, distilled water, then add 10 ml of 3 M hydrochloric acid solution. Pipette 50 ml of the dichromate solution into this mixture. Gently swirl the solution once and allow it to stand in the dark for 5 minutes. Dilute the solution with 100 to 200 ml of deionized distilled water, washing down the sides of the flask with part of the water. Titrate with 0.1 N thiosulfate until the solution is light yellow. Add 4 ml of starch indicator and continue titrating slowly to a green end point. Record V_s, the volume of thiosulfate solution used (ml). Repeat until replicate analyses agree within 0.05 ml. Calculate the normality using equation 9.1. Repeat the standardiza-

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tion each week, or after each test series, whichever time is shorter.

8.1.3 Standardize the 0.01 N Phenylarsine oxide (if applicable) as follows: oven dry potassium dichromate ($K_2Cr_2O_7$) at 180 to 200° C (360 to 390° F). Weigh to the nearest milligram, 2 g of the $K_2Cr_2O_7$; transfer the dichromate to a 500 ml volumetric flask, dissolve in deionized, distilled water, and dilute to exactly 500 ml. In a 500 ml iodine flask, dissolve approximately 0.3 g of potassium iodide (KI) in 45 ml of deionized, distilled water; add 10 ml of 3M hydrochloric acid. Pipette 5 ml of the $K_2Cr_2O_7$ solution into the iodine flask. Gently swirl the contents of the flask once and allow to stand in the dark for 5 minutes. Dilute the solution with 100 to 200 ml of deionized, distilled water, washing down the sides of the flask with part of the water. Titrate with 0.01 N phenylarsine oxide until the solution is light yellow. Add 4 ml of starch indicator and continue titrating slowly to a green end point. Record V_A, the volume of phenylarsine oxide used (ml). Repeat until replicate analyses agree within 0.05 ml. Calculate the normality using equation 9.2. Repeat the standardization each week or after each test series, whichever time is shorter.

8.2 Sampling train calibration. Calibrate the sampling train components as follows:

8.2.1 Dry gas meter.

8.2.1.1 Initial calibration. The dry gas meter shall be calibrated before its initial use in the field. Proceed as follows: First, assemble the following components in series: Drying tube, needle valve, pump, rotameter, and dry gas meter. Then, leak-check the system as follows: Place a vacuum gauge (at least 760 mm Hg) at the inlet to the drying tube and pull a vacuum of 250 mm (10 in.) Hg; plug or pinch off the outlet of the flow meter, and then turn off the pump. The vacuum shall remain stable for at least 30 seconds. Carefully release the vacuum gauge before releasing the flow meter end.

Next, calibrate the dry gas meter (at the sampling flow rate specified by the method) as follows: Connect an appropriately sized wet test meter (e.g., 1 liter per revolution) to the inlet of the drying tube. Make three independent calibration runs, using at least five revolutions of the dry gas meter per run. Calculate the calibration factor, *Y* (wet test meter calibration volume divided by the dry gas meter volume, both volumes adjusted to the same reference temperature and pressure), for each run, and average the results. If any *Y* value deviates by more than 2 percent from the average, the dry gas meter is unacceptable for use. Otherwise, use the average as the calibration factor for subsequent test runs.

8.2.1.2 Post-test calibration check. After each field test series, conduct a calibration check as in section 8.2.1.1. above, except for the following variations: (a) The leak check is not to be conducted, (b) three or more revolutions of the dry gas meter may be used, and (c) only two independent runs need be made. If the calibration factor does not deviate by more than 5 percent from the initial calibration factor (determined in section 8.2.1.1.), then the dry gas meter volumes obtained during the test series are acceptable. If the calibration factor deviates by more than 5 percent, recalibrate the dry gas meter as in section 8.2.1.1, and for the calculations, use the calibration factor (initial or recalibration) that yields the lower gas volume for each test run.

8.2.2 Thermometers. Calibrate against mercury-in-glass thermometers.

8.2.3 Rotameter. The rotameter need not be calibrated, but should be cleaned and maintained according to the manufacturer's instruction.

8.2.4 Barometer. Calibrate against a mercury barometer.

9. *Calculations.* Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off results only after the final calculation.

9.1 Normality of the Standard (~0.1 N) Thiosulfate Solution.

$$N_S = 2.039W/V_S$$

where:

W = Weight of $K_2Cr_2O_7$ used, g.
V_S = Volume of $Na_2S_2O_3$ solution used, ml.
N_S = Normality of standard thiosulfate solution, g-eq/liter.
2.039 = Conversion factor

(6 eq. I_2/mole $K_2Cr_2O_7$) (1,000 ml/liter)/= (294.2 g $K_2Cr_2O_7$/mole) (10 aliquot factor)

9.2 Normality of Standard Phenylarsine Oxide Solution (if applicable).

$$N_A = 0.2039\ W/V_A$$

where:

W = Weight of $K_2Cr_2O_7$ used, g.
V_A = Volume of $C_6H_5A_sO$ used, ml.
N_A = Normality of standard phenylarsine oxide solution, g=eq/liter.
0.2039 = Conversion factor

(6 eq. I_2/mole $K_2Cr_2O_7$) (1,000 ml/liter)/ (249.2 g $K_2Cr_2O_7$/mole) (100 aliquot factor)

9.3 Normality of Standard Iodine Solution.

$$N_I = N_TV_T/V_I$$

where:

N_I = Normality of standard iodine solution, g-eq/liter.
V_I = Volume of standard iodine solution used, ml.

N_T = Normality of standard (~0.01 N) thiosulfate solution; assumed to be 0.1 N_S, g-eq/liter.
V_T = Volume of thiosulfate solution used, ml.

NOTE: If phenylarsine oxide is used intead of thiosulfate, replace N_T and V_T in Equation 9.3 with N_A and V_{AS}, respectively (see sections 8.1.1 and 8.1.3).

9.4 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C) and 760 mm Hg.

$$V_{m(std)} = V_m Y [(T_{std}/T_m)(P_{bar}/P_{std})]$$

where:

$V_{m(std)}$ = Volume at standard conditions of gas sample through the dry gas meter, standard liters.
V_m = Volume of gas sample through the dry gas meter (meter conditions), liters.
T_{std} = Absolute temperature at standard conditions, 293° K.
T_m = Average dry gas meter temperature, °K.
P_{bar} = Barometric pressure at the sampling site, mm Hg.
P_{std} = Absolute pressure at standard conditions, 760 mm Hg.
Y = Dry gas meter calibration factor.

9.5 Concentration of H_2S. Calculate the concentration of H_2S in the gas stream at standard conditions using the following equation:

$$C_{H2S} = K[(V_{IT}N_I - V_{TT}N_T)\ \text{sample} - (V_{IT}N_I - V_{TT}N_T)\ \text{blank}]/V_{m(std)}$$

where (metric units):

C_{H2S} = Concentration of H_2S at standard conditions, mg/dscm.
K = Conversion factor = 17.04×10^3

(34.07 g/mole H_2S) (1,000 liters/m^3) (1,000 mg/g)/ = (1,000 ml/liter) ($2H_2S$ eq/mole)

V_{IT} = Volume of standard iodine solution = 50.0 ml.
N_I = Normality of standard iodine solution, g-eq/liter.
V_{TT} = Volume of standard (~0.01 N) sodium thiosulfate solution, ml.
N_T = Normality of standard sodium thiosulfate solution, g-eq/liter.
$V_{m(std)}$ = Dry gas volume at standard conditions, liters.

NOTE: If phenylarsine oxide is used instead of thiosulfate, replace N_T and V_{TT} in Equation 9.5 with N_A and V_{AT}, respectively (see Sections 7.3.1 and 8.1.3).

10. *Stability.* The absorbing solution is stable for at least 1 month. Sample recovery and analysis should begin within 1 hour of sampling to minimize oxidation of the acidified cadmium sulfide. Once iodine has been added to the sample, the remainder of the analysis procedure must be completed according to sections 7.2.2 through 7.3.2.

11. *Bibliography.*

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11.2 Tentative Method of Determination of Hydrogen Sulfide and Mercaptan Sulfur in Natural Gas, Natural Gas Processors Association, Tulsa, Okla., NGPA Publication No. 2265-65, 1965.

11.3 Knoll, J. E., and M. R. Midgett. Determination of Hydrogen Sulfide in Refinery Fuel Gases, Environmental Monitoring Series, Office of Research and Development, USEPA, Research Triangle Park, N.C. 27711, EPA 600/4-77-007.

11.4 Scheill, G. W., and M. C. Sharp. Standardization of Method 11 at a Petroleum Refinery, Midwest Research Institute Draft Report for USEPA, Office of Research and Development, Research Triangle Park, N.C. 27711, EPA Contract No. 68-02-1098, August 1976, EPA 600/4-77-088a (Volume 1) and EPA 600/4-77-088b (Volume 2).

METHOD 12—DETERMINATION OF INORGANIC LEAD EMISSIONS FROM STATIONARY SOURCES

1. *Applicability and Principle.*

1.1 Applicability. This method applies to the determination of inorganic lead (Pb) emissions from specified stationary sources only.

1.2 Principle. Particulate and gaseous Pb emissions are withdrawn isokinetically from the source and collected on a filter and in dilute nitric acid. The collected samples are digested in acid solution and analyzed by atomic absorption spectrometry using an air acetylene flame.

2. *Range, Sensitivity, Precision, and Interferences.*

2.1 Range. For a minimum analytical accuracy of ±10 percent, the lower limit of the range is 100 μg. The upper limit can be considerably extended by dilution.

2.2 Analytical Sensitivity. Typical sensitivities for a 1-percent change in absorption (0.0044 absorbance units) are 0.2 and 0.5 μg Pb/ml for the 217.0 and 283.3 nm lines, respectively.

2.3 Precision. The within-laboratory precision, as measured by the coefficient of variation ranges from 0.2 to 9.5 percent relative to a run-mean concentration. These values were based on tests conducted at a gray iron foundry, a lead storage battery manufacturing plant, a secondary lead smelter, and a lead recovery furnace of an alkyl lead manufacturing plant. The concentrations encountered during these tests ranged from 0.61 to 123.3 mg Pb/m^3.

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2.4 Interferences. Sample matrix effects may interfere with the analysis for Pb by flame atomic absorption. If this interference is suspected, the analyst may confirm the presence of these matrix effects and frequently eliminate the interference by using the Method of Standard Additions.

High concentrations of copper may interfere with the analysis of Pb at 217.0 nm. This interference can be avoided by analyzing the samples at 283.3 nm.

3. *Apparatus.*

3.1 Sampling Train. A schematic of the sampling train is shown in Figure 12-1; it is similar to the Method 5 train. The sampling train consists of the following components:

3.1.1 Probe Nozzle, Probe Liner, Pitot Tube, Differential Pressure Gauge, Filter Holder, Filter Heating System, Metering System, Barometer, and Gas Density Determination Equipment. Same as Method 5, Sections 2.1.1 to 2.1.6 and 2.1.8 to 2.1.10, respectively.

3.1.2 Impingers. Four impingers connected in series with leak-free ground glass fittings or any similar leak-free noncontaminating fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3 cm (½ in.) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. For the second impinger, use the Greenburg-Smith design with the standard tip. Place a thermometer, capable of measuring temperature to within 1°C (2°F) at the outlet of the fourth impinger for monitoring purposes.

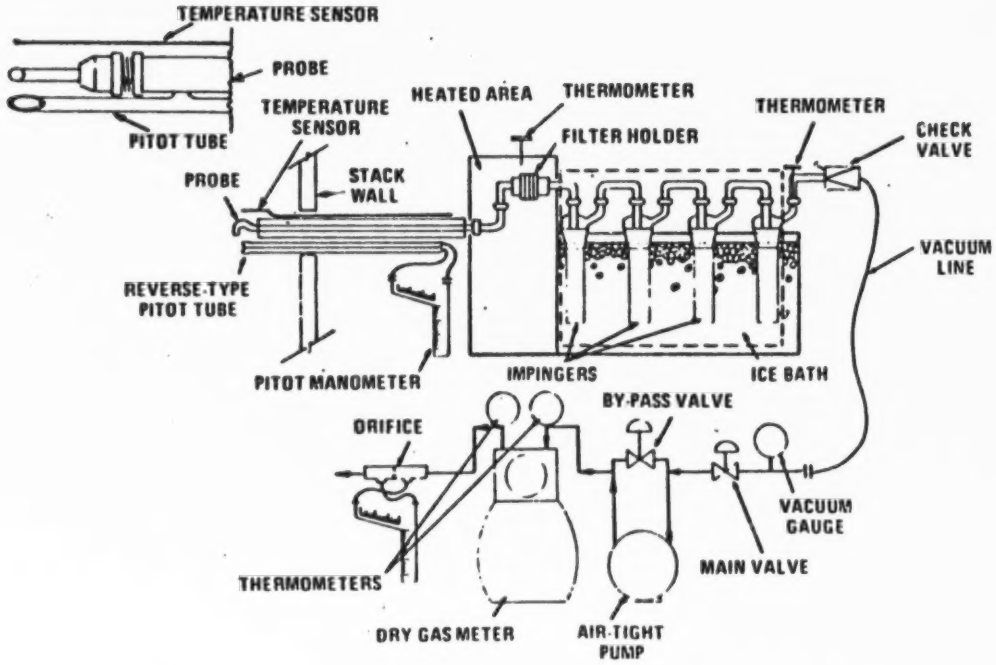

Figure 12-1. Inorganic lead sampling train.

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3.2 Sample Recovery. The following items are needed:

3.2.1 Probe-Liner and Probe-Nozzle Brushes, Petri Dishes, Plastic Storage Containers, and Funnel and Rubber Policeman. Same as Method 5, Sections 2.2.1, 2.2.4, 2.2.6, and 2.2.7, respectively.

3.2.2 Wash Bottles. Glass (2).

3.2.3 Sample Storage Containers. Chemically resistant, borosilicate glass bottles, for 0.1 nitric acid (HNO_3) impinger and probe solutions and washes, 1000-ml. Use screw-cap liners that are either rubber-backed Teflon* or leak-free and resistant to chemical attack by 0.1 N HNO_3. (Narrow mouth glass bottles have been found to be less prone to leakage.)

3.2.4 Graduated Cylinder and/or Balance. To measure condensed water to within 2 ml or 1 g. Use a graduated cylinder that has a minimum capacity of 500 ml, and subdivisions no greater than 5 ml. (Most laboratory balances are capable of weighing to the nearest 0.5 g or less.)

3.2.5 Funnel. Glass, to aid in sample recovery.

3.3 Analysis. The following equipment is needed:

3.3.1 Atomic Absorption Spectrophotometer. With lead hollow cathode lamp and burner for air/acetylene flame.

3.3.2 Hot Plate.

3.3.3 Erlenmeyer Flasks. 125-ml, 24/40 $.

3.3.4 Membrane Filters. Millipore SCWPO 4700 or equivalent.

3.3.5 Filtration Apparatus. Millipore vacuum filtration unit, or equivalent, for use with the above membrane filter.

3.3.6 Volumetric Flasks. 100-ml, 250-ml, and 1000-ml.

4. *Reagents.*

4.1 Sampling. The reagents used in sampling are as follows:

4.1.1 Filter. Gelman Spectro Grade, Reeve Angel 934 AH, MSA 1106 BH, all with lot assay for Pb, or other high-purity glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. Conduct the filter efficiency test using ASTM Standard Method D 2986-71 or use test data from the supplier's quality control program.

4.1.2 Silica Gel, Crushed Ice, and Stopcock Grease. Same as Method 5, Section 3.1.2, 3.1.4, and 3.1.5, respectively.

4.1.3 Water. Deionized distilled, to conform to ASTM Specification D 1193-74, Type 3. If high concentrations of organic matter are not expected to be present, the analyst may delete the potassium permanganate test for oxidizable organic matter.

4.1.4 Nitric Acid, 0.1 N. Dilute 6.5 ml of concentrated HNO_3 to 1 liter with deionized distilled water. (It may be desirable to run blanks before field use to eliminate a high blank on test samples.)

4.2 Pretest Preparation. 6 N HNO_3 is needed. Dilute 390 ml of concentrated HNO_3 to 1 liter with deionized distilled water.

4.3 Sample Recovery. 0.1 N HNO_3 (same as 4.1.4 above) is needed for sample recovery.

4.4 Analysis. The following reagents are needed for analysis (use ACS reagent grade chemicals or equivalent, unless otherwise specified):

4.4.1 Water. Same as 4.1.3 above.

4.4.2 Nitric Acid. Concentrated.

4.4.3 Nitric Acid, 50 percent (V/V). Dilute 500 ml of concentrated HNO_3 to 1 liter with deionized distilled water.

4.4.4 Stock Lead Standard Solution, 1000 μg Pb/ml. Dissolve 0.1598 g of lead nitrate [$Pb(NO_3)_2$] in about 60 ml of deionized distilled water, add 2 ml concentrated HNO_3, and dilute to 100 ml with deionized distilled water.

4.4.5 Working Lead Standards. Pipet 0.0, 1.0, 2.0, 3.0, 4.0, and 5.0 ml of the stock lead standard solution (4.4.4) into 250-ml volumetric flasks. Add 5 ml of concentrated HNO_3 to each flask and dilute to volume with deionized distilled water. These working standards contain 0.0, 4.0, 8.0, 12.0, 16.0, and 20.0 μg Pb/ml, respectively. Prepare, as needed, additional standards at other concentrations in a similar manner.

4.4.6 Air. Suitable quality for atomic absorption analysis.

4.4.7 Acetylene. Suitable quality for atomic absorption analysis.

4.4.8 Hydrogen Peroxide, 3 percent (V/V). Dilute 10 ml of 30 percent H_2O_2 to 100 ml with deionized distilled water.

5. *Procedure.*

5.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

5.1.1 Pretest Preparation. Follow the same general procedure given in Method 5, Section 4.1.1, except the filter need not be weighed.

5.1.2 Preliminary Determinations. Follow the same general procedure given in Method 5, Section 4.1.2.

5.1.3 Preparation of Collection Train. Follow the same general procedure given in Method 5, Section 4.1.3, except place 100 ml of 0.1 HNO_3 in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. Set up the train as shown in Figure 12-1.

5.1.4 Leak-Check Procedures. Follow the general leak-check procedures given in

*Mention of trade names or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.

Method 5, Sections 4.1.4.1. (Pretest Leak-Check), 4.1.4.2 (Leak-Checks During the Sample Run), and 4.1.4.3 (Post-Test Leak-Check).

5.1.5 Sampling Train Operation. Follow the same general procedure given in Method 5, Section 4.1.5. For each run, record the data required on a data sheet such as the one shown in EPA Method 5, Figure 5-2.

5.1.6 Calculation of Percent Isokinetic. Same as Method 5, Section 4.1.6.

5.2 *Sample Recovery.* Begin proper cleanup procedure as soon as the probe is removed from the stack at the end of the sampling period.

Allow the probe to cool. When it can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over it. Do not cap off the probe tip tightly while the sampling train is cooling down as this would create a vacuum in the filter holder, thus drawing liquid from the impingers into the filter.

Before moving the sampling train to the cleanup site, remove the probe from the sapling train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the glassware inlet where the probe was fastened and cap the inlet. Remove the umbilical cord from the last impinger and cap the impinger. The tester may use ground-glass stoppers, plastic caps, or serum caps to close these openings.

Transfer the probe and filter-impinger assembly to a cleanup area, which is clean and protected from the wind so that the chances of contaminating or losing the sample are minimized.

Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

5.2.1 *Container No. 1* (Filter). Carefully remove the filter from the filter holder and place it in its identified petri dish container. If it is necessary to fold the filter, do so such that the sample-exposed side is inside the fold. Carefully transfer to the petri dish any visible sample matter and/or filter fibers that adhere to the filter holder gasket by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

5.2.2 *Container No. 2* (Probe). Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover sample matter or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with 0.1 N HNO_3 and placing the wash into a glass sample storage container. Measure and record (to the nearest 2-ml) the total amount of 0.1 N HNO_3 used for each rinse. Perform the 0.1 N HNO_3 rinses as follows:

Carefully remove the probe nozzle and rinse the inside surfaces with 0.1 N HNO_3 from a wash bottle while brushing with a stainless steel, Nylon-bristle brush. Brush until the 0.1 N HNO_3 rinse shows no visible particles, then make a final rinse of the inside surface.

Brush and rinse with 0.1 N HNO_3 the inside parts of the Swagelok fitting in a similar way until no visible particles remain.

Rinse the probe liner with 0.1 N HNO_3. While rotating the probe so that all inside surfaces will be rinsed with 0.1 N HNO_3, tilt the probe and squirt 0.1 N HNO_3 into its upper end. Let the 0.1 N HNO_3 drain from the lower end into the sample container. The tester may use a glass funnel to aid in transferring liquid washes to the container. Follow the rinse with a probe brush. Hold the probe in an inclined position, squirt 0.1 N HNO_3 into the upper end of the probe as the probe brush is being pushed with a twisting action through the probe; hold the sample container underneath the lower end of the probe and catch any 0.1 N HNO_3 and sample matter that is brushed from the probe. Run the brush through the probe three times or more until no visible sample matter is carried out with the 0.1 N HNO_3 and none remains on the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times, since metal probes have small crevices in which sample matter can be entrapped. Rinse the brush with 0.1 N HNO_3 and quantitatively collect these washings in the sample container. After the brushing make a final rinse of the probe as described above.

It is recommended that two people clean the probe to minimize loss of sample. Between sampling runs, keep brushes clean and protected from contamination.

After insuring that all joints are wiped clean of silicone grease, brush and rinse with 0.1 N HNO_3 the inside of the front half of the filter holder. Brush and rinse each suface three times or more, if needed, to remove visible sample matter. Make a final rinse of the brush and filter holder. After all 0.1 N HNO_3 washings and sample matter are collected in the sample container, tighten the lid on the sample container so that the fluid will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to clearly identify its contents.

5.2.3 *Container No. 3* (Silica Gel). Check the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to the original container and seal. The tester may use a funnel to pour the silica gel and a

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rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of particles that may adhere to the walls and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, the tester may follow procedure for Container No. 3 under Section 5.4 (Analysis).

5.2.4 *Container No. 4* (Impingers). Due to the large quantity of liquid involved, the tester may place the impinger solutions in several containers. Clean each of the first three impingers and connecting glassware in the following manner:

1. Wipe the impinger ball joints free of silicone grease and cap the joints.

2. Rotate and agitate each impinger, so that the impinger contents might serve as a rinse solution.

3. Transfer the contents of the impingers to a 500-ml graduated cylinder. Remove the outlet ball joint cap and drain the contents through this opening. Do not separate the impinger parts (inner and outer tubes) while transferring their contents to the cylinder. Measure the liquid volume to within ±2 ml. Alternatively, determine the weight of the liquid to within ±0.5 g. Record in the log the volume or weight of the liquid present, along with a notation of any color or film observed in the impinger catch. The liquid volume or weight is needed, along with the silica gel data, to calculate the stack gas moisture content (see Method 5, Figure 5-3).

4. Transfer the contents to Container No. 4.

5. Note: In steps 5 and 6 below, measure and record the total amount of 0.1 N HNO_3 used for rinsing. Pour approximately 30 ml of 0.1 N HNO_3 into each of the first three impingers and agitate the impingers. Drain the 0.1 N HNO_3 through the outlet arm of each impinger into Container No. 4. Repeat this operation a second time; inspect the impingers for any abnormal conditions.

6. Wipe the ball joints of the glassware connecting the impingers free of silicone grease and rinse each piece of glassware twice with 0.1 N HNO_3; transfer this rinse into Container No. 4. (*Do not rinse or brush the glass-fritted filter support.*) Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to clearly identify its contents.

5.2.5 Blanks. Save 200 ml of the 0.1 N HNO_3 used for sampling and cleanup as a blank. Take the solution directly from the bottle being used and place into a glass sample container labeled "0.1 N HNO_3 blank."

5.3 Sample Preparation.

5.3.1 *Container No. 1* (Filter). Cut the filter into strips and transfer the strips and all loose particulate matter into a 125-ml Erlenmeyer flask. Rinse the petri dish with 10 ml of 50 percent HNO_3 to insure a quantitative transfer and add to the flask. (Note: If the total volume required in Section 5.3.3 is expected to exceed 80 ml, use a 250-ml Erlenmeyer flask in place of the 125-ml flask.)

5.3.2 *Containers No. 2 and No. 4* (Probe and Impingers). (Check the liquid level in Containers No. 2 and/or No. 4 and confirm as to whether or not leakage occurred during transport; note observation on the analysis sheet. If a noticeable amount of leakage had occurred, either void the sample or take steps, subject to the approval of the Administrator, to adjust the final results.) Combine the contents of Containers No. 2 and No. 4 and take to dryness on a hot plate.

5.3.3 Sample Extraction for lead. Based on the approximate stack gas particulate concentration and the total volume of stack gas sampled, estimate the total weight of particulate sample collected. Then transfer the residue from Containers No. 2 and No. 4 to the 125-ml Erlenmeyer flask that contains the filter using rubber policeman and 10 ml of 50 percent HNO_3 for every 100 mg of sample collected in the train or a minimum of 30 ml of 50 percent HNO_3, whichever is larger.

Place the Erlenmeyer flask on a hot plate and heat with periodic stirring for 30 min at a temperature just below boiling. If the sample volume falls below 15 ml, add more 50 percent HNO_3. Add 10 ml of 3 percent H_2O_2 and continue heating for 10 min. Add 50 ml of hot (80°C) deionized distilled water and heat for 20 min. Remove the flask from the hot plate and allow to cool. Filter the sample through a Millipore membrane filter or equivalent and transfer the filtrate to a 250-ml volumetric flask. Dilute to volume with deionized distilled water.

5.3.4 Filter Blank. Determine a filter blank using two filters from each lot of filters used in the sampling train. Cut each filter into strips and place each filter in a separate 125-ml Erlenmeyer flask. Add 15 ml of 50 percent HNO_3 and treat as described in Section 5.3.3 using 10 ml of 3 percent H_2O_2 and 50 ml of hot, deionized distilled water. Filter and dilute to a toal volume of 100 ml using deionized distilled water.

5.3.5 0.1 N HNO_3 Blank. Take the entire 200 ml of 0.1 N HNO_3 to dryness on a steam bath, add 15 ml of 50 percent HNO_3, and treat as described in Section 5.3.3 using 10 ml of 3 percent H_2O_2 and 50 ml of hot, deionized distilled water. Dilute to a total volume of 100 ml using deionized distilled water.

5.4 Analysis.

5.4.1 Lead Determination. Calibrate the spectrophotometer as described in Section 6.2 and determine the absorbance for each source sample, the filter blank, and 0.1 N HNO_3 blank. Analyze each sample three times in this manner. Make appropriate dilutions, as required, to bring all sample Pb concentrations into the linear absorbance range of the spectrophotometer.

If the Pb concentration of a sample is at the low end of the calibration curve and high accuracy is required, the sample can be taken to dryness on a hot plate and the residue dissolved in the appropriate volume of water to bring it into the optimum range of the calibration curve.

5.4.2 Mandatory Check for Matrix Effects on the Lead Results. The analysis for Pb by atomic absorption is sensitive to the chemical compositon and to the physical properties (viscosity. pH) of the sample (matrix effects). Since the Pb procedure described here will be applied to many different sources, many sample matrices will be encountered. Thus, check (mandatory) at least one sample from each source using the Method of Additions to ascertain that the chemical composition and physical properties of the sample did not cause erroneous analytical results.

Three acceptable "Method of Additions" procedures are described in the General Procedure Section of the Perkin Elmer Corporation Manual (see Citation 9.1). If the results of the Method of Additions procedure on the source sample do not agree within 5 percent of the value obtained by the conventional atomic absorption analysis, then the tester must reanalyze all samples from the source using the Method of Additions procedure.

5.4.3 *Container No. 3* (Silica Gel). The tester may conduct this step in the field. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g; record this weight.

6. *Calibration.*

Maintain a laboratory log of all calibrations.

6.1 Sampling Train Calibration. Calibrate the sampling train components according to the indicated sections of Method 5: Probe Nozzle (Section 5.1); Pitot Tube (Section 5.2); Metering System (Section 5.3); Probe Heater (Section 5.4); Temperature Gauges (Section 5.5); Leak-Check of the Metering System (Section 5.6); and Barometer (Section 5.7).

6.2 Spectrophotometer. Measure the absorbance of the standard solutions using the instrument settings recommended by the spectrophotometer manufacturer. Repeat until good agreement (±3 percent) is obtained between two consecutive readings. Plot the absorbance (y-axis) versus concentration in μg Pb/ml (x-axis). Draw or compute a straight line through the linear portion of the curve. Do not force the calibration curve through zero, but if the curve does not pass through the origin or at least lie closer to the origin than ±0.003 absorbance units, check for incorrectly prepared standards and for curvature in the calibration curve.

To determine stability of the calibration curve, run a blank and a standard after every five samples and recalibrate, as necessary.

7. *Calculations.*

7.1 Dry Gas Volume. Using the data from this test, calculate $V_{m(std)}$, the total volume of dry gas metered corrected to standard conditions (20°C and 760 mm Hg), by using Equation 5-1 of Method 5. If necessary, adjust $V_{m(std)}$ for leakages as outlined in Section 6.3 of Method 5. See the field data sheet for the average dry gas meter temperature and average orifice pressure drop.

7.2 Volume of Water Vapor and Moisture Content. Using data obtained in this test and Equations 5-2 and 5-3 of Method 5, calculate the volume of water vapor $V_{w(std)}$) and the moisture content B_{ws} of the stack gas.

7.3 Total Lead in Source Sample. For each source sample correct the average absorbance for the contribution of the filter blank and the 0.1 N HNO_3 blank. Use the calibration curve and this corrected absorbance to determine the μg Pb concentration in the sample aspirated into the spectrophotometer. Calculate the total Pb content C'_{Pb} (in μg) in the original source sample; correct for all the dilutions that were made to bring the Pb concentration of the sample into the linear range of the spectrophotometer.

7.4 Lead Concentration. Calculate the stack gas Pb concentration C_{Pb} in mg/dscm as follows:

$$C_{Pb} = K \frac{C'_{Pb}}{V_{m(std)}}$$

Where:

K=0.001 mg/μg for metric units.

=2.205 lb/μg for English units.

7.5 Isokinetic Variation and Acceptable Results. Same as Method 5, Sections 6.11 and 6.12, respectively. To calculate v_s, the average stack gas velocity, use Equation 2-9 of Method 2 and the data from this field test.

8. *Alternative Test Methods for Inorganic Lead.*

8.1 Simultaneous Determination of Particulate and Lead Emissions. The tester may use Method 5 to simultaneously determine Pb provided that (1) he uses acetone to remove particulate from the probe and inside of the filter holder as specified by Method 5, (2) he uses 0.1 N HNO_3 in the impingers, (3) he uses a glass fiber filter with a

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low Pb background, and (4) he treats and analyzes the entire train contents, including the impingers, for Pb as described in Section 5 of this method.

8.2 Filter Location. The tester may use a filter between the third and fourth impinger provided that he includes the filter in the analysis for Pb.

8.3 In-stack Filter. The tester may use an in-stack filter provided that (1) he uses a glass-lined probe and at least two impingers, each containing 100 ml of 0.1 N HNO_3, after the in-stack filter and (2) he recovers and analyzes the probe and impinger contents for Pb. Recover sample from the nozzle with acetone if a particulate analysis is to be made.

9. *Bibliography*

9.1 Perkin Elmer Corporation. Analytical Methods for Atomic Absorption Spectrophotometry. Norwalk, Connecticut. September 1976.

9.2 American Society for Testing and Materials. Annual Book of ASTM Standards. Part 31; Water, Atmospheric Analysis. Philadelphia, Pa. 1974. p. 40–42.

9.3 Klein, R. and C. Hach. Standard Additions—Uses and Limitations in Spectrophotometric Analysis. *Amer. Lab.* 9:21-27. 1977.

9.4 Mitchell, W.J. and M.R. Midgett. Determining Inorganic and Alkyl Lead Emissions from Stationary Sources. U.S. Environmental Protection Agency, Emission Monitoring and Support Laboratory. Research Triangle Park, N.C. (Presented at National APCA Meeting. Houston. June 26, 1978).

9.5 Same as Method 5, Citations 2 to 5 and 7 of Section 7.

Method 13A—Determination of Total Fluoride Emissions From Stationary Sources; SPADNS Zirconium Lake Method

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of fluoride (F) emissions from sources as specified in the regulations. It does not measure fluorocarbons, such as freons.

1.2 Principle. Gaseous and particulate F are withdrawn isokinetically from the source and collected in water and on a filter. The total F is then determined by the SPADNS Zirconium Lake colorimetric method.

2. Range and Sensitivity

The range of this method is 0 to 1.4 μg F/ml. Sensitivity has not been determined.

3. Interferences

Large quantities of chloride will interfere with the analysis, but this interference can be prevented by adding silver sulfate into the distillation flask (see Section 7.3.4). If chloride ion is present, it may be easier to use the Specific Ion Electrode Method (Method 13B). Grease on sample-exposed surfaces may cause low F results due to adsorption.

4. Precision, Accuracy, and Stability

4.1 Precision. The following estimates are based on a collaborative test done at a primary aluminum smelter. In the test, six laboratories each sampled the stack simultaneously using two sampling trains for a total of 12 samples per sampling run. Fluoride concentrations encountered during the test ranged from 0.1 to 1.4 mg F/m^3. The within-laboratory and between-laboratory standard deviations, which include sampling and analysis errors, were 0.044 mg F/m^3 with 60 degrees of freedom and 0.064 mg F/m^3 with five degrees of freedom, respectively.

4.2 Accuracy. The collaborative test did not find any bias in the analytical method.

4.3 Stability. After the sample and colorimetric reagent are mixed, the color formed is stable for approximately 2 hours. A 3°C temperature difference between the sample and standard solutions produces an error of approximately 0.005 mg F/liter. To avoid this error, the absorbances of the sample and standard solutions must be measured at the same temperature.

5. Apparatus

5.1 Sampling Train. A schematic of the sampling train is shown in Figure 13A-1; it is similar to the Method 5 train except the filter position is interchangeable. The sampling train consists of the following components:

5.1.1 Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Filter Heating System, Metering System, Barometer, and Gas Density Determination Equipment. Same as Method 5, Sections 2.1.1, 2.1.3, 2.1.4, 2.1.6, 2.1.8, 2.1.9, and 2.1.10. When moisture condensation is a problem, the filter heating system is used.

5.1.2 Probe Liner. Borosilicate glass or 316 stainless steel. When the filter is located immediately after the probe, the tester may use a probe heating system to prevent filter plugging resulting from moisture condensation, but the tester shall not allow the temperature in the probe to exceed 120±14°C (248±25°F).

5.1.3 Filter Holder. With positive seal against leakage from the outside or around the filter. If the filter is located between the probe and first impinger, use borosilicate glass or stainless steel with a 20-mesh stainless steel screen filter support and a silicone rubber gasket; do not use a glass frit or a

sintered metal filter support. If the filter is located between the third and fourth impingers, the tester may use borosilicate glass with a glass frit filter support and a silicone rubber gasket. The tester may also use other materials of construction with approval from the Administrator.

5.1.4 Impingers. Four impingers connected as shown in Figure 13A-1 with ground-glass (or equivalent), vacuum-tight fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm-inside-diameter (½ in.) glass tube extending to 1.3 cm (½ in.) from the bottom of the flask. For the second impinger, use a Greenburg-Smith impinger with the standard tip. The tester may use modifications (e.g., flexible connections between the impingers or materials other than glass), subject to the approval of the Administrator. Place a thermometer, capable of measuring temperature to within 1°C (2°F), at the outlet of the fourth impinger for monitoring purposes.

5.2 Sample Recovery. The following items are needed:

5.2.1 Probe-Liner and Probe-Nozzle Brushes, Wash Bottles, Graduated Cylinder and/or Balance, Plastic Storage Containers, Rubber Policeman, Funnel. Same as Method 5, Sections 2.2.1 to 2.2.2 and 2.2.5 to 2.2.8, respectively.

5.2.2 Sample Storage Container. Wide-mouth, high-density-polyethylene bottles for impinger water samples, 1-liter.

5.3 Analysis. The following equipment is needed:

5.3.1 Distillation Apparatus. Glass distillation apparatus assembled as shown in Figure 13A-2.

5.3.2 Bunsen Burner.

5.3.3 Electric Muffle Furnace. Capable of heating to 600°C.

5.3.4 Crucibles. Nickel, 75- to 100-ml.

5.3.5 Beakers. 500-ml and 1500-ml.

5.3.6 Volumetric Flasks. 50-ml.

5.3.7 Erlenmeyer Flasks or Plastic Bottles. 500-ml.

5.3.8 Constant Temperature Bath. Capable of maintaining a constant temperature of ±1.0°C at room temperature conditions.

5.3.9 Balance. 300-g capacity to measure to ±0.5 g.

5 3.10 Spectrophotometer. Instrument that measures absorbance at 570 nm and provides at least a 1-cm light path.

5.3.11 Spectrophotometer Cells. 1-cm pathlength.

6. Reagents

6.1 Sampling. Use ACS reagent-grade chemicals or equivalent, unless otherwise specified. The reagents used in sampling are as follows:

6.1.1 Filters.

6.1.1.1 If the filter is located between the third and fourth impingers, use a Whatman [1] No. 1 filter, or equivalent, sized to fit the filter holder.

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[1] Mention of company or product names does not constitute endorsement by the U.S. Environmental Protection Agency.

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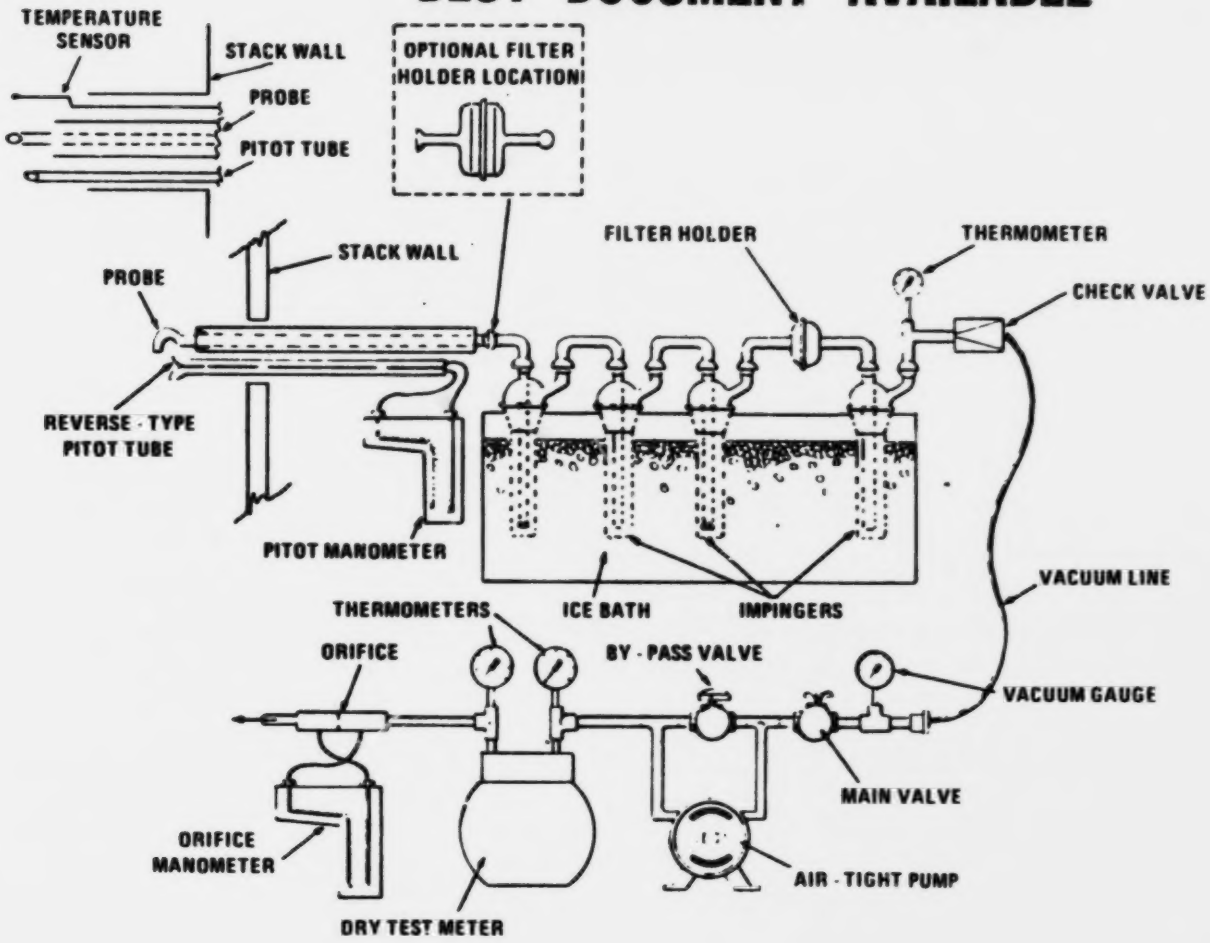

Figure 13A-1. Fluoride sampling train.

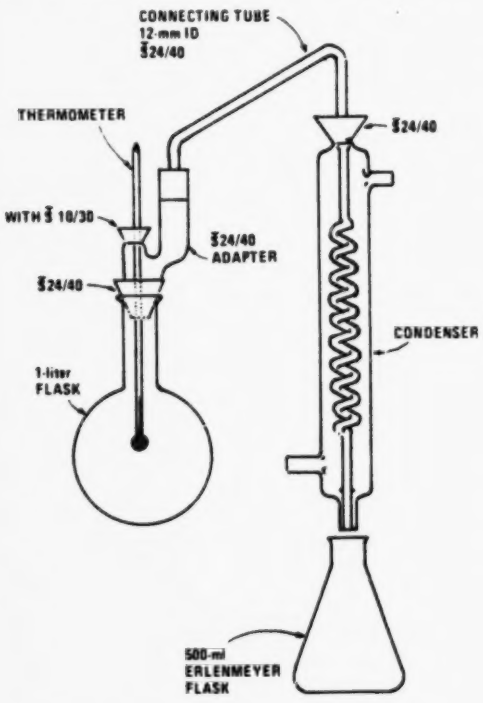

Figure 13A-2. Fluoride distillation apparatus.

6.1.1.2 If the filter is located between the probe and first impinger, use any suitable medium (e.g., paper, organic membrane) that conforms to the following specifications: (1) The filter can withstand prolonged exposure to temperatures up to 135°C (275°F). (2) The filter has at least 95 percent collection efficiency (<5 percent penetration) for 0.3 μm dioctyl phthalate smoke particles. Conduct the filter efficiency test before the test series, using ASTM Standard Method D 2986-71, or use test data from the supplier's quality control program. (3) The filter has a low F blank value (<0.015 mg F/cm² of filter area). Before the test series, determine the average F blank value of at least three filters (from the lot to be used for sampling) using the applicable procedures described in Sections 7.3 and 7.4 of this method. In general, glass fiber filters have high and/or variable F blank values, and will not be acceptable for use.

6.1.2 Water. Deionized distilled, to conform to ASTM Specification D 1193-74, Type 3. If high concentrations of organic matter are not expected to be present, the analyst may delete the potassium permanganate test for oxidizable organic matter.

6.1.3 Silica Gel, Crushed Ice, and Stopcock Grease. Same as Method 5, Section 3.1.2, 3.1.4, and 3.1.5, respectively.

6.2 Sample Recovery. Water, from same container as described in Section 6.1.2, is needed for sample recovery.

6.3 Sample Preparation and Analysis. The reagents needed for sample preparation and analysis are as follows:

6.3.1 Calcium Oxide (CaO). Certified grade containing 0.005 percent F or less.

6.3.2 Phenolphthalein Indicator. Dissolve 0.1 g of phenolphthalein in a mixture of 50 ml of 90 percent ethanol and 50 ml of deionized distilled water.

6.3.3 Silver Sulfate (Ag_2SO_4).

6.3.4 Sodium Hydroxide (NaOH). Pellets.

6.3.5 Sulfuric Acid (H_2SO_4), Concentrated.

6.3.6 Sulfuric Acid, 25 percent (V/V). Mix 1 part of concentrated H_2SO_4 with 3 parts of deionized distilled water.

6.3.7 Filters. Whatman No. 541, or equivalent.

6.3.8 Hydrochloric Acid (HCl), Concentrated.

6.3.9 Water. From same container as described in Section 6.1.2.

6.3.10 Fluoride Standard Solution, 0.01 mg F/ml. Dry in an oven at 110°C for at least 2 hours. Dissolve 0.2210 g of NaF in 1 liter of deionized distilled water. Dilute 100 ml of this solution to 1 liter with deionized distilled water.

6.3.11 SPADNS Solution [4, 5 dihydroxy-3-(p-sulfophenylazo)-2,7-naphthalene-disulfonic acid trisodium salt]. Dissolve 0.960 ± 0.010 g of SPADNS reagent in 500 ml deionized distilled water. If stored in a well-sealed bottle protected from the sunlight, this solution is stable for at least 1 month.

6.3.12 Spectrophotometer Zero Reference Solution. Prepare daily. Add 10 ml of SPADNS solution (6.3.11) to 100 ml deionized distilled water, and acidify with a solution prepared by diluting 7 ml of concentrated HCl to 10 ml with deionized distilled water.

6.3.13 SPADNS Mixed Reagent. Dissolve 0.135 ± 0.005 g of zirconyl chloride octahydrate ($ZrOCl_2 \cdot 8H_2O$) in 25 ml of deionized distilled water. Add 350 ml of concentrated HCl, and dilute to 500 ml with deionized distilled water. Mix equal volumes of this solution and SPADNS solution to form a single reagent. This reagent is stable for at least 2 months.

7. Procedure

7.1 Sampling. Because of the complexity of this method, testers should be trained and experienced with the test procedures to assure reliable results.

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7.1.1 Pretest Preparation. Follow the general procedure given in Method 5, Section 4.1.1, except the filter need not be weighed.

7.1.2 Preliminary Determinations. Follow the general procedure given in Method 5, Section 4.1.2., except the nozzle size selected must maintain isokinetic sampling rates below 28 liters/min (1.0 cfm).

7.1.3 Preparation of Collection Train. Follow the general procedure given in Method 5, Section 4.1.3, except for the following variations:

Place 100 ml of deionized distilled water in each of the first two impingers, and leave the third impinger empty. Transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger.

Assemble the train as shown in Figure 13A-1 with the filter between the third and fourth impingers. Alternatively, if a 20-mesh stainless steel screen is used for the filter support, the tester may place the filter between the probe and first impinger. The tester may also use a filter heating system to prevent moisture condensation, but shall not allow the temperature around the filter holder to exceed $120 \pm 14°C$ ($248 \pm 25°F$). Record the filter location on the data sheet.

7.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, Sections 4.1.4.1 (Pretest Leak-Check), 4.1.4.2 (Leak-Checks During the Sample Run), and 4.1.4.3 (Post-Test Leak-Check).

7.1.5 Fluoride Train Operation. Follow the general procedure given in Method 5, Section 4.1.5, keeping the filter and probe temperatures (if applicable) at $120 \pm 14°C$ ($248 \pm 25°F$) and isokinetic sampling rates below 28 liters/min (1.0 cfm). For each run, record the data required on a data sheet such as the one shown in Method 5, Figure 5-2.

7.2 Sample Recovery. Begin proper cleanup procedure as soon as the probe is removed from the stack at the end of the sampling period.

Allow the probe to cool. When it can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over it to keep from losing part of the sample. Do not cap off the probe tip tightly while the sampling train is cooling down, because a vacuum would form in the filter holder, thus drawing impinger water backwards.

Before moving the sample train to the cleanup site, remove the probe from the sample train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate, if present. Remove the filter assembly, wipe off the silicone grease from the filter holder inlet, and cap this inlet. Remove the umbilical cord from the last impinger, and cap the impinger. After wiping off the silicone grease, cap off the filter holder outlet and any open impinger inlets and outlets. The tester may use ground-glass stoppers, plastic caps, or serum caps to close these openings.

Transfer the probe and filter-impinger assembly to an area that is clean and protected from the wind so that the chances of contaminating or losing the sample is minimized.

Inspect the train before and during disassembly, and note any abnormal conditions. Treat the samples as follows:

7.2.1 *Container No. 1* (Probe, Filter, and Impinger Catches). Using a graduated cylinder, measure to the nearest ml, and record the volume of the water in the first three impingers; include any condensate in the probe in this determination. Transfer the impinger water from the graduated cylinder into this polyethylene container. Add the filter to this container. (The filter may be handled separately using procedures subject to the Administrator's approval.) Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, clean all sample-exposed surfaces (including the probe nozzle, probe fitting, probe liner, first three impingers, impinger connectors, and filter holder) with deionized distilled water. Use less than 500 ml for the entire wash. Add the washings to the sampler container. Perform the deionized distilled water rinses as follows:

Carefully remove the probe nozzle and rinse the inside surface with deionized distilled water from a wash bottle. Brush with a Nylon bristle brush, and rinse until the rinse shows no visible particles, after which make a final rinse of the inside surface. Brush and rinse the inside parts of the Swagelok fitting with deionized distilled water in a similar way.

Rinse the probe liner with deionized distilled water. While squirting the water into the upper end of the probe, tilt and rotate the probe so that all inside surfaces will be wetted with water. Let the water drain from the lower end into the sample container. The tester may use a funnel (glass or polyethylene) to aid in transferring the liquid washes to the container. Follow the rinse with a probe brush. Hold the probe in an inclined position, and squirt deionized distilled water into the upper end as the probe brush is being pushed with a twisting action through the probe. Hold the sample container underneath the lower end of the probe, and catch any water and particulate matter that is brushed from the probe. Run the brush through the probe three times or more. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with deionized distilled water,

and quantitatively collect these washings in the sample container. After the brushing, make a final rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

Rinse the inside surface of each of the first three impingers (and connecting glassware) three separate times. Use a small portion of deionized distilled water for each rinse, and brush each sample-exposed surface with a Nylon bristle brush, to ensure recovery of fine particulate matter. Make a final rinse of each surface and of the brush.

After ensuring that all joints have been wiped clean of the silicone grease, brush and rinse with deionized distilled water the inside of the filter holder (front-half only, if filter is positioned between the third and fourth impingers). Brush and rinse each surface three times or more if needed. Make a final rinse of the brush and filter holder.

After all water washings and particulate matter have been collected in the sample container, tighten the lid so that water will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container clearly to identify its contents.

7.2.2 *Container No. 2* (Sample Blank). Prepare a blank by placing an unused filter in a polyethylene container and adding a volume of water equal to the total volume in Container No. 1. Process the blank in the same manner as for Container No. 1.

7.2.3 *Container No. 3* (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. The tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, the tester may follow the analytical procedure for Container No. 3 in Section 7.4.2.

7.3 Sample Preparation and Distillation. (Note the liquid levels in Containers No. 1 and No. 2 and confirm on the analysis sheet whether or not leakage occurred during transport. If noticeable leakage had occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.) Treat the contents of each sample container as described below:

7.3.1 *Container No. 1* (Probe, Filter, and Impinger Catches). Filter this container's contents, including the sampling filter, through Whatman No. 541 filter paper, or equivalent, into a 1500-ml beaker.

7.3.1.1 If the filtrate volume exceeds 900 ml, make the filtrate basic (red to phenolphthalein) with NaOH, and evaporate to less than 900 ml.

7.3.1.2 Place the filtered material (including sampling filter) in a nickel crucible, add a few ml of deionized distilled water, and macerate the filters with a glass rod.

Add 100 mg CaO to the crucible, and mix the contents thoroughly to form a slurry. Add two drops of phenolphthalein indicator. Place the crucible in a hood under infrared lamps or on a hot plate at low heat. Evaporate the water completely. During the evaporation of the water, keep the slurry basic (red to phenolphthalein) to avoid loss of F. If the indicator turns colorless (acidic) during the evaporation, add CaO until the color turns red again.

After evaporation of the water, place the crucible on a hot plate under a hood and slowly increase the temperature until the Whatman No. 541 and sampling filters char. It may take several hours to completely char the filters.

Place the crucible in a cold muffle furnace. Gradually (to prevent smoking) increase the temperature to 600°C, and maintain until the contents are reduced to an ash. Remove the crucible from the furnace and allow to cool.

Add approximately 4 g of crushed NaOH to the crucible and mix. Return the crucible to the muffle furnace, and fuse the sample for 10 minutes at 600°C.

Remove the sample from the furnace, and cool to ambient temperature. Using several rinsings of warm deionized distilled water, transfer the contents of the crucible to the beaker containing the filtrate. To assure complete sample removal, rinse finally with two 20-ml portions of 25 percent H_2SO_4, and carefully add to the beaker. Mix well, and transfer to a 1-liter volumetric flask. Dilute to volume with deionized distilled water, and mix thoroughly. Allow any undissolved solids to settle.

7.3.2 *Container No. 2* (Sample Blank). Treat in the same manner as described in Section 7.3.1 above.

7.3.3 Adjustment of Acid/Water Ratio in Distillation Flask. (Use a protective shield when carrying out this procedure.) Place 400 ml of deionized distilled water in the distillation flask, and add 200 ml of concentrated H_2SO_4. (Caution: Observe standard precautions when mixing H_2SO_4 with water. Slowly add the acid to the flask with constant swirling.) Add some soft glass beads and several small pieces of broken glass tubing, and assemble the apparatus as

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shown in Figure 13A-2. Heat the flask until it reaches a temperature of 175°C to adjust the acid/water ratio for subsequent distillations. Discard the distillate.

7.3.4 Distillation. Cool the contents of the distillation flask to below 80°C. Pipet an aliquot of sample containing less than 10.0 mg F directly into the distillation flask, and add deionized distilled water to make a total volume of 220 ml added to the distillation flask. (To estimate the appropriate aliquot size, select an aliquot of the solution and treat as described in Section 7.4.1. This will be an approximation of the F content because of possible interfering ions.)

NOTE: If the sample contains chloride, add 5 mg of Ag_2SO_4 to the flask for every mg of chloride.

Place a 250-ml volumetric flask at the condenser exit. Heat the flask as rapidly as possible with a Bunsen burner, and collect all the distillate up to 175°C. During heatup, play the burner flame up and down the side of the flask to prevent bumping. Conduct the distillation as rapidly as possible (15 minutes or less). Slow distillations have been found to produce low F recoveries. Caution: Be careful not to exceed 175°C to avoid causing H_2SO_4 to distill over.

If F distillation in the mg range is to be followed by a distillation in the fractional mg range, add 220 ml of deionized distilled water and distill it over as in the acid adjustment step to remove residual F from the distillation system.

The tester may use the acid in the distillation flask until there is carry-over of interferences or poor F recovery. Check for these every tenth distillation using a deionized distilled water blank and a standard solution. Change the acid whenever the F recovery is less than 90 percent or the blank value exceeds 0.1 μg/ml.

7.4 Analysis.

7.4.1 Containers No. 1 and No. 2. After distilling suitable aliquots from Containers No. 1 and No. 2 according to Section 7.3.4, dilute the distillate in the volumetric flasks to exactly 250 ml with deionized distilled water, and mix thoroughly. Pipet a suitable aliquot of each sample distillate (containing 10 to 40 μg F/ml) into a beaker, and dilute to 50 ml with deionized distilled water. Use the same aliquot size for the blank. Add 10 ml of SPADNS mixed reagent (6.3.13), and mix thoroughly.

After mixing, place the sample in a constant-temperature bath containing the standard solutions (see Section 8.2) for 30 minutes before reading the absorbance on the spectrophotometer.

Set the spectrophotometer to zero absorbance at 570 nm with the reference solution (6.3.12), and check the spectrophotometer calibration with the standard solution. Determine the absorbance of the samples, and determine the concentration from the calibration curve. If the concentration does not fall within the range of the calibration curve, repeat the procedure using a different size aliquot.

7.4.2 *Container No. 3* (Silica Gel). Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. The tester may conduct this step in the field.

8. Calibration

Maintain a laboratory log of all calibrations.

8.1 Sampling Train. Calibrate the sampling train components according to the indicated sections in Method 5: Probe Nozzle (Section 5.1); Pitot Tube (Section 5.2); Metering System (Section 5.3); Probe heater (Section 5.4); Temperature Gauges (Section 5.5); Leak Check of Metering System (Section 5.6); and Barometer (Section 5.7).

8.2 Spectrophotometer. Prepare the blank standard by adding 10 ml of SPADNS mixed reagent to 50 ml of deionized distilled water. Accurately prepare a series of standards from the 0.01 mg F/ml standard fluoride solution (6.3.10) by diluting 0, 2, 4, 6, 8, 10, 12, and 14 ml to 100 ml with deionized distilled water. Pipet 50 ml from each solution and transfer each to a separate 100-ml beaker. Then add 10 ml of SPADNS mixed reagent to each. These standards will contain 0, 10, 20, 30, 40 50, 60, and 70 μg F (0 to 1.4 μg/ml), respectively.

After mixing, place the reference standards and reference solution in a constant temperature bath for 30 minutes before reading the absorbance with the spectrophotometer. Adjust all samples to this same temperature before analyzing.

With the spectrophotometer at 570 nm, use the reference solution (6.3.12) to set the absorbance to zero.

Determine the absorbance of the standards. Prepare a calibration curve by plotting μg F/50 ml versus absorbance on linear graph paper. Prepare the standard curve initially and thereafter whenever the SPADNS mixed reagent is newly made. Also, run a calibration standard with each set of samples and if it differs from the calibration curve by ±2 percent, prepare a new standard curve.

9. Calculations

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation. Other forms of the equations may be used, provided that they yield equivalent results.

9.1 Nomenclature.

A_d = Aliquot of distillate taken for color development, ml.

A_t = Aliquot of total sample added to still, ml.
B_{ws} = Water vapor in the gas stream, proportion by volume.
C_s = Concentration of F in stack gas, mg/m³, dry basis, corrected to standard conditions of 760 mm Hg (29.92 in. Hg) and 293°K (528°R).
F_t = Total F in sample, mg.
μg F = Concentration from the calibration curve, μg.
T_m = Absolute average dry gas meter temperature (see Figure 5-2 of Method 5), °K (°R).
T_s = Absolute average stack gas temperature (see Figure 5-2 of Method 5), °K (°R).
V_d = Volume of distillate as diluted, ml.
$V_{m(std)}$ = Volume of gas sample as measured by dry gas meter, corrected to standard conditions, dscm (dscf).
V_t = Total volume of F sample, after final dilution, ml.
$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

9.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 5-2 of Method 5).

9.3 Dry Gas Volume. Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in section 6.3 of Method 5.

9.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor $V_{w(std)}$ and moisture content B_{ws} from the data obtained in this method (Figure 13A-1); use Equations 5-2 and 5-3 of Method 5.

9.5 Concentration.

9.5.1 Total Fluoride in Sample. Calculate the amount of F in the sample using the following equation:

$$F_t = 10^{-3} \frac{V_t}{A_t} \frac{V_d}{A_d} \quad (\mu g\ F)$$

Eq. 13A-1

9.5.2 Fluoride Concentration in Stack Gas. Determine the F concentration in the stack gas using the following equation:

$$C_s = K \frac{F_t}{V_{m(std)}}$$

Eq. 13A—2

Where:

K = 35.31 ft³/m³ if $V_{m(std)}$ is expressed in English units.
= 1.00 m³/m³ if $V_{m(std)}$ is expressed in metric units.

9.6 Isokinetic Variation and Acceptable Results. Use Method 5, Sections 6.11 and 6.12.

10. Bibliography

1. Bellack, Ervin, Simplified Fluoride Distillation Method. Journal of the American Water Works Association. *50*:5306. 1958.

2. Mitchell, W. J., J. C. Suggs, and F. J. Bergman. Collaborative Study of EPA method 13A and Method 13B. Publication No. EPA-600/4-77-050. Environmental Protection Agency. Research Triangle Park, North Carolina. December 1977.

3. Mitchell, W. J. and M. R. Midgett. Adequacy of Sampling Trains and Analytical Procedures Used for Fluoride. Atm. Environ. *10*:865-872. 1976.

Method 13B—Determination of Total Fluoride Emissions From Stationary Sources—Specific Ion Electrode Method

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of fluoride (F) emissions from stationary sources as specified in the regulations. It does not measure fluorocarbons, such as freons.

1.2 Principle. Gaseous and particulate F are withdrawn isokinetically from the source and collected in water and on a filter. The total F is then determined by the specific ion electrode method.

2. Range and Sensitivity

The range of this method is 0.02 to 2,000 μg F/ml; however, measurements of less than 0.1 μg F/ml require extra care. Sensitivity has not been determined.

3. Interferences

Grease on sample-exposed surfaces may cause low F results because of adsorption.

4. Precision and Accuracy

4.1 Precision. The following estimates are based on a collaborative test done at a primary aluminum smelter. In the test, six laboratories each sampled the stack simultaneously using two sampling trains for a total of 12 samples per sampling run. Fluoride concentrations encountered during the test ranged from 0.1 to 1.4 mg F/m³. The within-laboratory and between-laboratory standard deviations, which include sampling and analysis errors, are 0.037 mg F/m³ with 60 degrees of freedom and 0.056 mg F/m³ with five degrees of freedom, respectively.

4.2 Accuracy. The collaborative test did not find any bias in the analytical method.

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5. Apparatus

5.1 Sampling Train and Sample Recovery. Same as Method 13A, Sections 5.1 and 5.2, respectively.

5.2 Analysis. The following items are needed:

5.2.1 Distillation Apparatus, Bunsen Burner, Electric Muffle Furnace, Crucibles, Beakers, Volumetric Flasks, Erlenmeyer Flasks or Plastic Bottles, Constant Temperature Bath, and Balance. Same as Method 13A, Sections 5.3.1 to 5.3.9, respectively, except include also 100-ml polyethylene beakers.

5.2.2 Fluoride Ion Activity Sensing Electrode.

5.2.3 Reference Electrode. Single junction, sleeve type.

5.2.4 Electrometer. A pH meter with millivolt-scale capable of ±0.1-mv resolution, or a specific ion meter made specifically for specific ion use.

5.2.5 Magnetic Stirrer and TFE [2] Fluorocarbon-Coated Stirring Bars.

6. Reagents

6.1 Sampling and Sample Recovery. Same as Method 13A, Sections 6.1 and 6.2, respectively.

6.2 Analysis. Use ACS reagent grade chemicals (or equivalent), unless otherwise specified. The reagents needed for analysis are as follows:

6.2.1 Calcium Oxide (CaO). Certified grade containing 0.005 percent F or less.

6.2.2 Phenolphthalein Indicator. Dissolve 0.1 g of phenolphthalein in a mixture of 50 ml of 90 percent ethanol and 50 ml deionized distilled water.

6.2.3 Sodium Hydroxide (NaOH). Pellets.

6.2.4 Sulfuric Acid (H_2SO_4), Concentrated.

6.2.5 Filters. Whatman No. 541, or equivalent.

6.2.6 Water. From same container as 6.1.2 of Method 13A.

6.2.7 Sodium Hydroxide, 5 M. Dissolve 20 g of NaOH in 100 ml of deionized distilled water.

6.2.8 Sulfuric Acid, 25 percent (V/V). Mix 1 part of concentrated H_2SO_4 with 3 parts of deionized distilled water.

6.2.9 Total Ionic Strength Adjustment Buffer (TISAB). Place approximately 500 ml of deionized distilled water in a 1-liter beaker. Add 57 ml of glacial acetic acid, 58 g of sodium chloride, and 4 g of cyclohexylene dinitrilo tetraacetic acid. Stir to dissolve. Place the beaker in a water bath to cool it. Slowly add 5 M NaOH to the solution, measuring the pH continuously with a calibrated pH/reference electrode pair, until the pH is 5.3. Cool to room temperature. Pour into a 1-liter volumetric flask, and dilute to volume with deionized distilled water. Commercially prepared TISAB may be substituted for the above.

6.2.10 Fluoride Standard Solution, 0.1 M. Oven dry some sodium fluoride (NaF) for a minimum of 2 hours at 110°C, and store in a desiccator. Then add 4.2 g of NaF to a 1-liter volumetric flask, and add enough deionized distilled water to dissolve. Dilute to volume with deionized distilled water.

7. Procedure

7.1 Sampling, Sample Recovery, and Sample Preparation and Distillation. Same as Method 13A, Sections 7.1, 7.2, and 7.3, respectively, except the notes concerning chloride and sulfate interferences are not applicable.

7.2 Analysis.

7.2.1 Containers No. 1 and No. 2. Distill suitable aliquots from Containers No. 1 and No. 2. Dilute the distillate in the volumetric flasks to exactly 250 ml with deionized distilled water and mix thoroughly. Pipet a 25-ml aliquot from each of the distillate and separate beakers. Add an equal volume of TISAB, and mix. The sample should be at the same temperature as the calibration standards when measurements are made. If ambient laboratory temperature fluctuates more than ±2°C from the temperature at which the calibration standards were measured, condition samples and standards in a constant-temperature bath before measurement. Stir the sample with a magnetic stirrer during measurement to minimize electrode response time. If the stirrer generates enough heat to change solution temperature, place a piece of temperature insulating material such as cork, between the stirrer and the beaker. Hold dilute samples (below 10^{-4} M fluoride ion content) in polyethylene beakers during measurement.

Insert the fluoride and reference electrodes into the solution. When a steady millivolt reading is obtained, record it. This may take several minutes. Determine concentration from the calibration curve. Between electrode measurements, rinse the electrode with deionized distilled water.

7.2.2 Container No. 3 (Silica Gel). Same as Method 13A, Section 7.4.2.

8. Calibration

Maintain a laboratory log of all calibrations.

8.1 Sampling Train. Same as Method 13A.

8.2 Fluoride Electrode. Prepare fluoride standardizing solutions by serial dilution of the 0.1 M fluoride standard solution. Pipet 10 ml of 0.1 M fluoride standard solution

[2] Mention of any trade name or specific product does not constitute endorsement by the U.S. Environmental Protection Agency.

into a 100-ml volumetric flask, and make up to the mark with deionized distilled water for a 10^{-2} M standard solution. Use 10 ml of 10^{-2} M solution to make a 10^{-3} M solution in the same manner. Repeat the dilution procedure and make 10^{-4} and 10^{-5} solutions.

Pipet 50 ml of each standard into a separate beaker. Add 50 ml of TISAB to each beaker. Place the electrode in the most dilute standard solution. When a steady millivolt reading is obtained, plot the value on the linear axis of semilog graph paper versus concentration on the log axis. Plot the nominal value for concentration of the standard on the log axis, e.g., when 50 ml of 10^{-2} M standard is diluted with 50 ml of TISAB, the concentration is still designated "10^{-2} M."

Between measurements soak the fluoride sensing electrode in deionized distilled water for 30 seconds, and then remove and blot dry. Analyze the standards going from dilute to concentrated standards. A straight-line calibration curve will be obtained, with nominal concentrations of 10^{-4}, 10^{-3}, 10^{-2}, and 10^{-1} fluoride molarity on the log axis plotted versus electrode potential (in mv) on the linear scale. Some electrodes may be slightly nonlinear between 10^{-5} and 10^{-4} M. If this occurs, use additional standards between these two concentrations.

Calibrate the fluoride electrode daily, and check it hourly. Prepare fresh fluoride standardizing solutions daily (10^{-2} M or less). Store fluoride standardizing solutions in polyethylene or polypropylene containers.

NOTE: Certain specific ion meters have been designed specifically for fluoride electrode use and give a direct readout of fluoride ion concentration. These meters may be used in lieu of calibration curves for fluoride measurements over narrow concentration ranges. Calibrate the meter according to the manufacturer's instructions.)

9. Calculations

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

9.1 Nomenclature. Same as Method 13A, Section 9.1. In addition:

M = F concentration from calibration curve, molarity.

9.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop, Dry Gas Volume, Volume of Water Vapor and Moisture Content, Fluoride Concentration in Stack Gas, and Isokinetic Variation and Acceptable Results. Same as Method 13A, Section 9.2 to 9.4, 9.5.2, and 9.6, respectively.

9.3 Fluoride in Sample. Calculate the amount of F in the sample using the following:

$$F_s = K \left(\frac{V_t}{A_t} - V_d \right) M \qquad \text{Equation 13B-1}$$

Where:

K = 19 mg/ml.

10. References

1. Same as Method 13A, Citations 1 and 2 of Section 10.

2. MacLeod, Kathryn E. and Howard L. Crist. Comparison of the SPADNS—Zirconium Lake and Specific Ion Electrode Methods of Fluoride Determination in Stack Emission Samples. Analytical Chemistry. *45*:1272-1273. 1973.

METHOD 14—DETERMINATION OF FLUORIDE EMISSIONS FROM POTROOM ROOF MONITORS FOR PRIMARY ALUMINUM PLANTS

1. *Applicability and Principle.*

1.1 Applicability. This method is applicable for the determination of fluoride emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards.

1.2 Principle. Gaseous and particulate fluoride roof monitor emissions are drawn into a permanent sampling manifold through several large nozzles. The sample is transported from the sampling manifold to ground level through a duct. The gas in the duct is sampled using Method 13A or 13B—Determination of Total Fluoride Emissions from Stationary Sources. Effluent velocity and volumetric flow rate are determined with anemometers located in the roof monitor.

2. *Apparatus.*

2.1 Velocity measurement apparatus.

2.1.1 Anemometers. Propeller anemometers, or equivalent. Each anemometer shall meet the following specifications: (1) Its propeller shall be made of polystyrene, or similar material of uniform density. To insure uniformity of performance among propellers, it is desirable that all propellers be made from the same mold; (2) The propeller shall be properly balanced, to optimize performance; (3) When the anemometer is mounted horizontally, its threshold velocity shall not exceed 15 m/min (50 fpm); (4) The measurement range of the anemometer shall extend to at least 600 m/min (2,000 fpm); (5) The anemometer shall be able to withstand prolonged exposure to dusty and corrosive environments; one way of achieving this is to continuously purge the bearings of the anemometer with filtered air during operation; (6) All anemometer components shall be properly shielded or encased, such that the performance of the anemometer is uninfluenced by potroom

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magnetic field effects; (7) A known relationship shall exist between the electrical output signal from the anemometer generator and the propeller shaft rpm, at a minimum of three evenly spaced rpm settings between 60 and 1800 rpm; for the 3 settings, use 60±15, 900±100, and 1800±100 rpm. Anemometers having other types of output signals (e.g., optical) may be used, subject to the approval of the Administrator. If other types of anemometers are used, there must be a known relationship (as described above) between output signal and shaft rpm; also, each anemometer must be equipped with a suitable readout system (See Section 2.1.3).

2.1.2 Installation of anemometers.

2.1.2.1 If the affected facility consists of a single, isolated potroom (or potroom segment), install at least one anemometer for every 85 m of roof monitor length. If the length of the roof monitor divided by 85 m is not a whole number, round the fraction to the nearest whole number to determine the number of anemometers needed. For monitors that are less than 130 m in length, use at least two anemometers. Divide the monitor cross-section into as many equal areas as anemometers and locate an anemometer at the centroid of each equal area. See exception in Section 2.1.2.3.

2.1.2.2 If the affected facility consists of two or more potrooms (or potroom segments) ducted to a common control device, install anemometers in each potroom (or segment) that contains a sampling manifold. Install at least one anemometer for every 85 m of roof monitor length of the potroom (or segment). If the potroom (or segment) length divided by 85 is not a whole number, round the fraction to the nearest whole number to determine the number of anemometers needed. If the potroom (or segment) length is less than 130 m, use at least two anemometers. Divide the potroom (or segment) monitor cross-section into as many equal areas as anemometers and locate an anemometer at the centroid of each equal area. See exception in Section 2.1.2.3.

2.1.2.3 At least one anemometer shall be installed in the immediate vicinity (i.e., within 10 m) of the center of the manifold (See Section 2.2.1). For its placement in relation to the width of the monitor, there are two alternatives. The first is to make a velocity traverse of the width of the roof monitor where an anemometer is to be placed and install the anemometer at a point of average velocity along this traverse. The traverse may be made with any suitable low velocity measuring device, and shall be made during normal process operating conditions.

The second alternative, at the option of the tester, is to install the anemometer halfway across the width of the roof monitor. In this latter case, the velocity traverse need not be conducted.

2.1.3 Recorders. Recorders, equipped with suitable auxiliary equipment (e.g. transducers) for converting the output signal from each anemometer to a continuous recording of air flow velocity, or to an integrated measure of volumetric flowrate. A suitable recorder is one that allows the output signal from the propeller anemometer to be read to within 1 percent when the velocity is between 100 and 120 m/min (350 and 400 fpm). For the purpose of recording velocity, "continuous" shall mean one readout per 15-minute or shorter time interval. A constant amount of time shall elapse between readings. Volumetric flow rate may be determined by an electrical count of anemometer revolutions. The recorders or counters shall permit identification of the velocities or flowrate measured by each individual anemometer.

2.1.4 Pitot tube. Standard-type pitot tube, as described in Section 2.7 of Method 2, and having a coefficient of 0.99±0.01.

2.1.5 Pitot tube (optional). Isolated, Type S pitot, as described in Section 2.1 of Method 2. The pitot tube shall have a known coefficient, determined as outlined in Section 4.1 of Method 2.

2.1.6 Differential pressure gauge. Inclined manometer or equivalent, as described in Section 2.1.2 of Method 2.

2.2 Roof monitor air sampling system.

2.2.1 Sampling ductwork. A minimum of one manifold system shall be installed for each potroom group (as defined in Subpart S, Section 60.191). The manifold system and connecting duct shall be permanently installed to draw an air sample from the roof monitor to ground level. A typical installation of a duct for drawing a sample from a roof monitor to ground level is shown in Figure 14-1. A plan of a manifold system that is located in a roof monitor is shown in Figure 14.2. These drawings represent a typical installation for a generalized roof monitor. The dimensions on these figures may be altered slightly to make the manifold system fit into a particular roof monitor, but the general configuration shall be followed. There shall be eight nozzles, each having a diameter of 0.40 to 0.50 m. Unless otherwise specified by the Administrator, the length of the manifold system from the first nozzle to the eighth shall be 35 m or eight percent of the length of the potroom (or potroom segment) roof monitor, whichever is greater. The duct leading from the roof monitor manifold shall be round with a diameter of 0.30 to 0.40 m. As shown in Figure 14-2, each of the sample legs of the manifold shall have a device, such as a blast gate or valve, to enable adjustment of the flow into each sample nozzle.

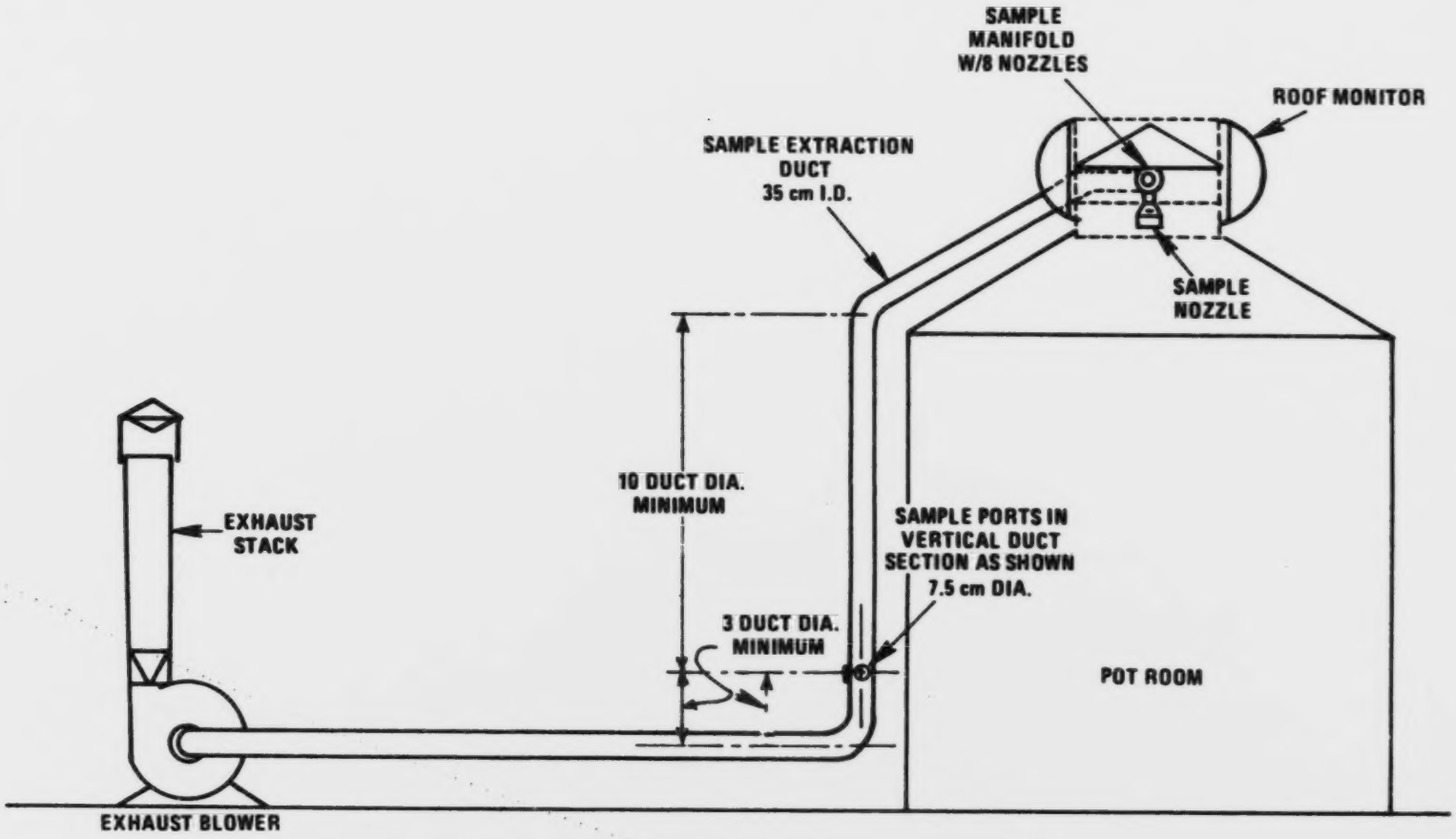

Figure 14-1. Roof monitor sampling system.

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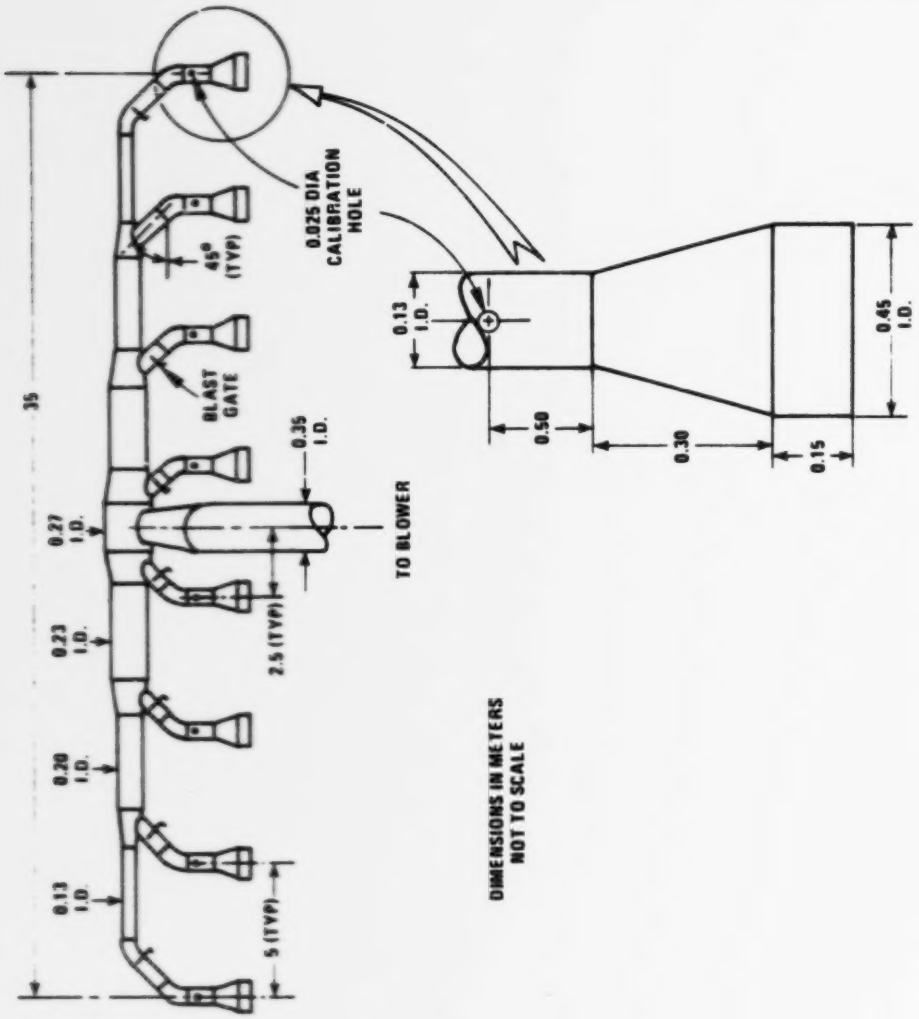

Figure 14 2. Sampling manifold and nozzles.

The manifold shall be located in the immediate vicinity of one of the propeller anemometers (see Section 2.1.2.3) and as close as possible to the midsection of the potroom (or potroom segment). Avoid locating the manifold near the end of a potroom or in a section where the aluminum reduction pot arrangement is not typical of the rest of the potroom (or potroom segment). Center the sample nozzles in the throat of the roof monitor (see Figure 14-1). Construct all sample-exposed surfaces within the nozzles, manifold and sample duct of 316 stainless steel. Aluminum may be used if a new ductwork system is conditioned with fluoride-laden roof monitor air for a period of six weeks prior to initial testing. Other materials of construction may be used if it is demonstrated through comparative testing that there is no loss of flourides in the system. All connections in the ductwork shall be leak free.

Locate two sample ports in a vertical section of the duct between the roof monitor and exhaust fan. The sample ports shall be at least 10 duct diameters downstream and three diameters upstream from any flow

disturbance such as a bend or contraction. The two sample ports shall be situated 90° apart. One of the sample ports shall be situated so that the duct can be traversed in the plane of the nearest upstream duct bend.

2.2.2 Exhaust fan. An industrial fan or blower shall be attached to the sample duct at ground level (see Figure 14-1). This exhaust fan shall have a capacity such that a large enough volume of air can be pulled through the ductwork to maintain an isokinetic sampling rate in all the sample nozzles for all flow rates normally encountered in the roof monitor.

The exhaust fan volumetric flow rate shall be adjustable so that the roof monitor air can be drawn isokinetically into the sample nozzles. This control of flow may be achieved by a damper on the inlet to the exhauster or by any other workable method.

2.3 Temperature measurement apparatus.

2.3.1 Thermocouple. Install a thermocouple in the roof monitor near the sample duct. The thermocouple shall conform to the specifications outlined in Section 2.3 of Method 2.

2.3.2 Signal transducer. Transducer, to change the thermocouple voltage output to a temperature readout.

2.3.3 Thermocouple wire. To reach from roof monitor to signal transducer and recorder.

2.3.4 Recorder. Suitable recorder to monitor the output from the thermocouple signal transducer.

2.4 Fluoride sampling train. Use the train described in Method 13A or 13B.

3. *Reagents.*

3.1 Sampling and analysis. Use reagents described in Method 13A or 13B.

4. *Calibration.*

4.1 Initial performance checks. Conduct these checks within 60 days prior to the first performance test.

4.1.1 Propeller anemometers. Anemometers which meet the specifications outlined in Section 2.1.1 need not be calibrated, provided that a reference performance curve relating anemometer signal output to air velocity (covering the velocity range of interest) is available from the manufacturer. For the purpose of this method, a "reference" performance curve is defined as one that has been derived from primary standard calibration data, with the anemometer mounted vertically. "Primary standard" data are obtainable by: (1) Direct calibration of one or more of the anemometers by the National Bureau of Standards (NBS); (2) NBS-traceable calibration; or (3) Calibration by direct measurement of fundamental parameters such as length and time (e.g., by moving the anemometers through still air at measured rates of speed, and recording the output signals). If a reference performance curve is not available from the manufacturer, such a curve shall be generated, using one of the three methods described as above. Conduct a performance-check as outlined in Section 4.1.1.1 through 4.1.1.3, below. Alternatively, the tester may use any other suitable method, subject to the approval of the Administrator, that takes into account the signal output, propeller condition and threshold velocity of the anemometer.

4.1.1.1 Check the signal output of the anemometer by using an accurate rpm generator (see Figure 14-3) or synchronous motors to spin the propeller shaft at each of the three rpm settings described in Section 2.1.1 above (specification No. 7), and measuring the output signal at each setting. If, at each setting, the output signal is within ± 5 percent of the manufacturer's value, the anemometer can be used. If the anemometer performance is unsatisfactory, the anemometer shall either be replaced or repaired.

4.1.1.2 Check the propeller condition, by visually inspecting the propeller, making note of any significant damage or warpage; damaged or deformed propellers shall be replaced.

4.1.1.3 Check the anemometer threshold velocity as follows: With the anemometer mounted as shown in Figure 14-4(A), fasten a known weight (a straight-pin will suffice) to the anemometer propeller at a fixed distance from the center of the propeller shaft. This will generate a known torque; for example, a 0.1 g weight, placed 10 cm from the center of the shaft, will generate a torque of 1.0 g-cm. If the known torque causes the propeller to rotate downward, approximately 90° [see Figure 14-4(B)], then the known torque is greater than or equal to the starting torque; if the propeller fails to rotate approximately 90°, the known torque is less than the starting torque. By trying different combinations of weight and distance, the starting torque of a particular anemometer can be satisfactorily estimated. Once an estimate of the starting torque has been obtained, the threshold velocity of the anemometer (for horizontal mounting) can be estimated from a graph such as Figure 14-5 (obtained from the manufacturer). If the horizontal threshold velocity is acceptable [<15 m/min (50 fpm), when this technique is used], the anemometer can be used. If the threshold velocity of an anemometer is found to be unacceptably high, the anemometer shall either be replaced or repaired.

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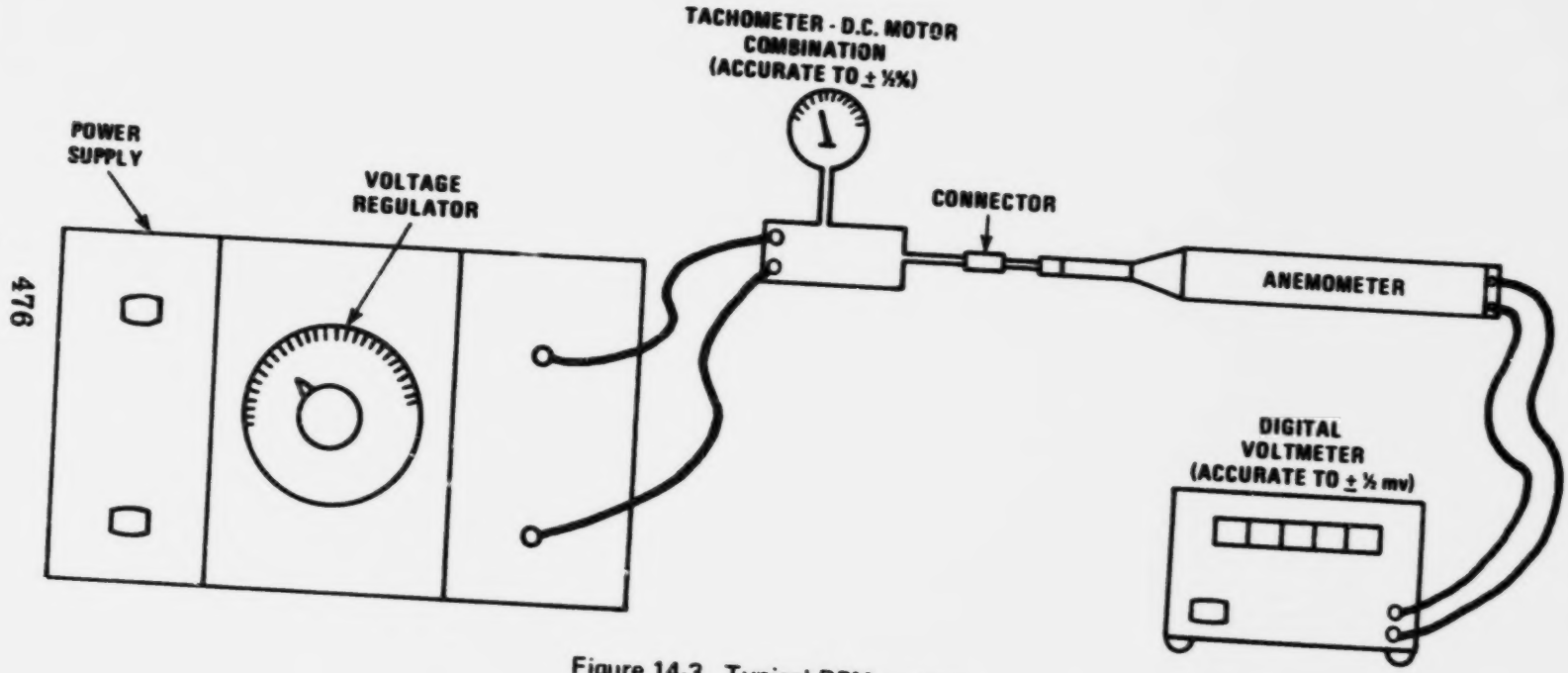

Figure 14-3. Typical RPM generator.

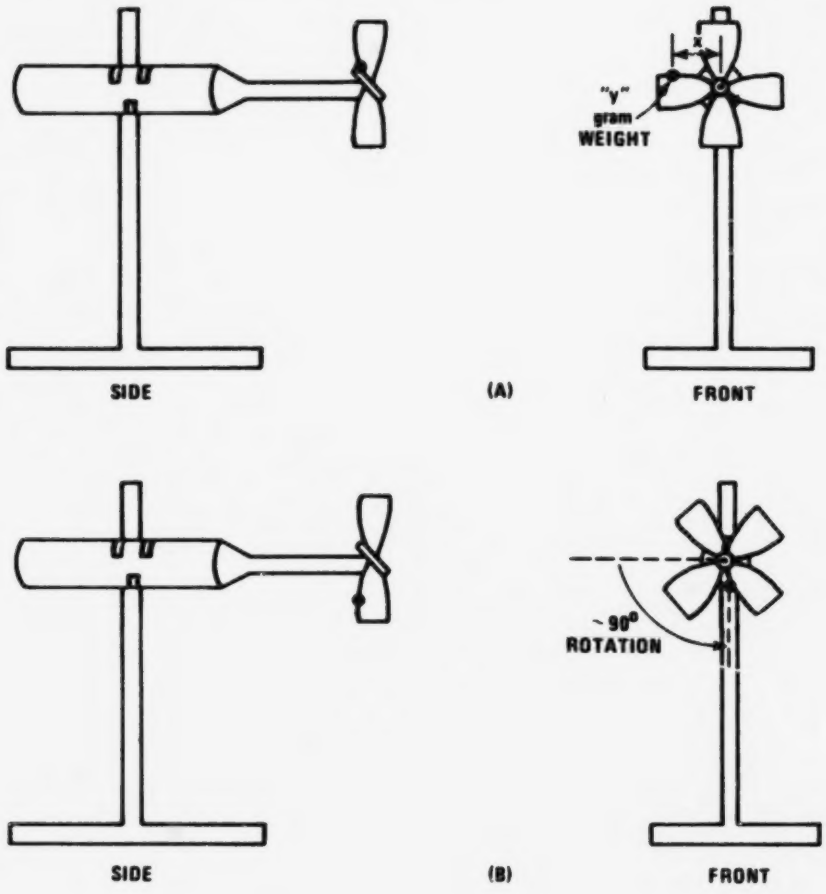

Figure 14-4. Check of anemometer starting torque. A "y" gram weight placed "x" centimeters from center of propeller shaft produces a torque of "xy" g-cm. The minimum torque which produces a 90° (approximately) rotation of the propeller is the "starting torque."

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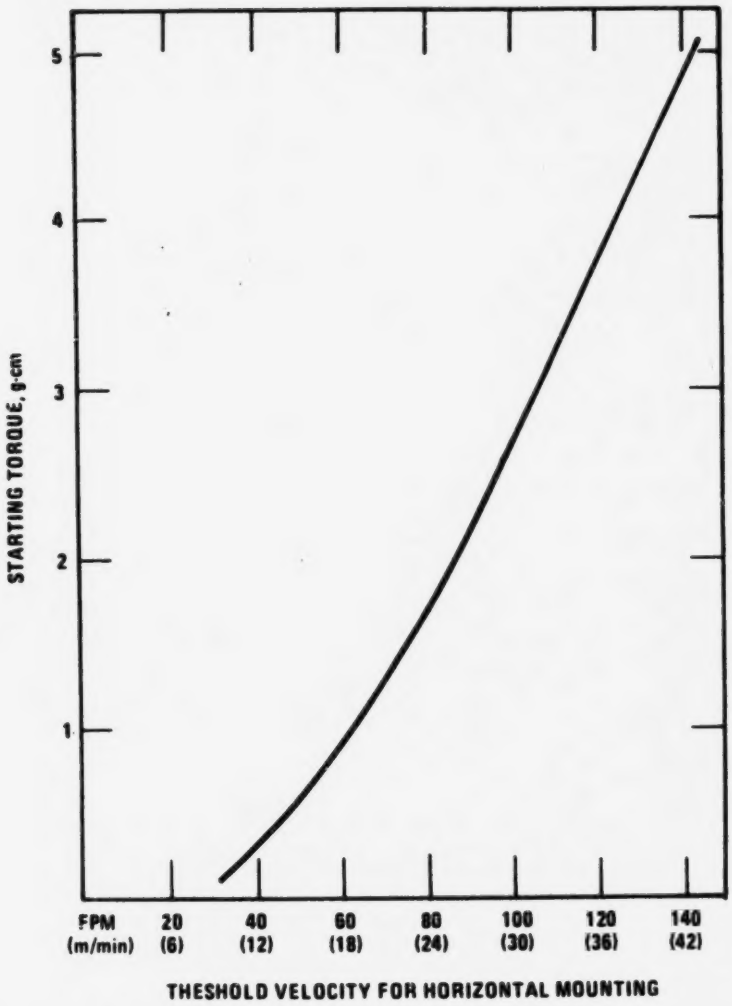

Figure 14 5. Typical curve of starting torque vs horizontal threshold velocity for propeller anemometers. Based on data obtained by R.M. Young Company, May, 1977.

4.1.2 Thermocouple. Check the calibration of the thermocouple-potentiometer system, using the procedures outlined in Section 4.3 of Method 2, at temperatures of 0, 100, and 150°C. If the calibration is off by more than 5°C at any of the temperatures, repair or replace the system; otherwise, the system can be used.

4.1.3 Recorders and/or counters. Check the calibration of each recorder and/or counter (see Section 2.1.3) at a minimum of three points, approximately spanning the expected range of velocities. Use the calibration procedures recommended by the manufacturer, or other suitable procedures (subject to the approval of the Administrator). If a recorder or counter is found to be out of calibration, by an average amount greater than 5 percent for the three calibration points, replace or repair the system; otherwise, the system can be used.

4.1.4 Manifold Intake Nozzles. In order to balance the flow rates in the eight individual nozzles, proceed as follows: Adjust the exhaust fan to draw a volumetric flow rate (refer to Equation 14-1) such that the entrance velocity into each manifold nozzle approximates the average effluent velocity in the roof monitor. Measure the velocity of the air entering each nozzle by inserting a standard pitot tube into a 2.5 cm or less diameter hole (see Figure 14-2) located in the manifold between each blast gate (or valve) and nozzle. Note that a standard pitot tube is used, rather than a type S, to eliminate possible velocity measurement errors due to cross-section blockage in the small (0.13 m diameter) manifold leg ducts. The pitot tube tip shall be positioned at the center of each manifold leg duct. Take care to insure that there is no leakage around the pitot tube, which could affect the indicated velocity in the manifold leg. If the velocity of air being drawn into each nozzle is not the same, open or close each blast gate (or valve) until the velocity in each nozzle is the same. Fasten each blast gate (or valve) so that it will remain in this position and close the pitot port holes. This calibration shall be performed when the manifold system is installed. Alternatively, the manifold may be preassembled and the flow rates balanced on the ground, before being installed.

4.2 Periodical performance checks. Twelve months after their initial installation, check the calibration of the propeller anemometers, thermocouple-potentiometer system, and the recorders and/or counters as in Section 4.1. If the above systems pass the performance checks, (i.e., if no repair or replacement of any component is necessary), continue with the performance checks on a 12-month interval basis. However, if any of the above systems fail the performance checks, repair or replace the system(s) that failed and conduct the periodical performance checks on a 3-month interval basis, until sufficient information (consult with the Administrator) is obtained to establish a modified performance check schedule and calculation procedure.

NOTE: If any of the above systems fail the initial performance checks, the data for the past year need not be recalculated.

5. *Procedure.*

5.1 Roof Monitor Velocity Determination.

5.1.1 Velocity estimate(s) for setting isokinetic flow. To assist in setting isokinetic flow in the manifold sample nozzles, the anticipated average velocity in the section of the roof monitor containing the sampling manifold shall be estimated prior to each test run. The tester may use any convenient means to make this estimate (e.g., the velocity indicated by the anemometer in the section of the roof monitor containing the sampling manifold may be continuously monitored during the 24-hour period prior to the test run).

If there is question as to whether a single estimate of average velocity is adequate for an entire test run (e.g., if velocities are anticipated to be significantly different during different potroom operations), the tester may opt to divide the test run into two or more "sub-runs," and to use a different estimated average velocity for each sub-run (see Section 5.3.2.2.)

5.1.2 Velocity determination during a test run. During the actual test run, record the velocity or volumetric flowrate readings of each propeller anemometer in the roof monitor. Readings shall be taken for each anemometer every 15 minutes or at shorter equal time intervals (or continuously).

5.2 Temperature recording. Record the temperature of the roof monitor every 2 hours during the test run.

5.3 Sampling.

5.3.1 Preliminary air flow in duct. During 24 hours preceding the test, turn on the exhaust fan and draw roof monitor air through the manifold duct to condition the ductwork. Adjust the fan to draw a volumetric flow through the duct such that the velocity of gas entering the manifold nozzles approximates the average velocity of the air exiting the roof monitor in the vicinity of the sampling manifold.

5.3.2 Manifold isokinetic sample rate adjustment(s).

5.3.2.1 Initial adjustment. Prior to the test run (or first sub-run, if applicable; see Section 5.1.1 and 5.3.2.2), adjust the fan to provide the necessary volumetric flowrate in the sampling duct, so that air enters the manifold sample nozzles at a velocity equal to the appropriate estimated average velocity determined under Section 5.1.1. Equation 14-1 gives the correct stream velocity needed in the duct at the sampling location, in order for sample gas to be drawn isokinetically into the manifold nozzles. Next, verify that the correct stream velocity has been achieved, by performing a pitot tube traverse of the sample duct (using either a standard or type S pitot tube); use the procedure outlined in Method 2.

$$v_d = \frac{8\,(D_n)^2}{(D_d)^2}\,(v_m)\,\frac{1\text{ min}}{60\text{ sec}} \qquad \text{(Equation 14-1)}$$

Where:

v_d = Desired velocity in duct at sampling location, m/sec.

D_n = Diameter of a roof monitor manifold nozzle, m.

D_d = Diameter of duct at sampling location, m.

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v_m=Average velocity of the air stream in the roof monitor, m/min, as determined under Section 5.1.1.

5.3.2.2 Adjustments during run. If the test run is divided into two or more "sub-runs" (see Section 5.1.1), additional isokinetic rate adjustment(s) may become necessary during the run. Any such adjustment shall be made just before the start of a sub-run, using the procedure outlined in Section 5.3.2.1 above.

NOTE: Isokinetic rate adjustments are not permissible during a sub-run.

5.3.3 Sample train operation. Sample the duct using the standard fluoride train and methods described in Methods 13A and 13B. Determine the number and location of the sampling points in accordance with Method 1. A single train shall be used for the entire sampling run. Alternatively, if two or more sub-runs are performed, a separate train may be used for each sub-run; note, however, that if this option is chosen, the area of the sampling nozzle shall be the same (± 2 percent) for each train. If the test run is divided into sub-runs, a complete traverse of the duct shall be performed during each sub-run.

5.3.4 Time per run. Each test run shall last 8 hours or more; if more than one run is to be performed, all runs shall be of approximately the same (± 10 percent) length. If question exists as to the representativeness of an 8-hour test, a longer period should be selected. Conduct each run during a period when all normal operations are performed underneath the sampling manifold. For most recently-constructed plants, 24 hours are required for all potroom operations and events to occur in the area beneath the sampling manifold. During the test period, all pots in the potroom group shall be operated such that emissions are representative of normal operating conditions in the potroom group.

5.3.5 Sample recovery. Use the sample recovery procedure described in Method 13A or 13B.

5.4 Analysis. Use the analysis procedures described in Method 13A or 13B.

6. *Calculations.*

6.1 Isokinetic sampling check.

6.1.1 Calculate the mean velocity (v_m) for the sampling run, as measured by the anemometer in the section of the roof monitor containing the sampling manifold. If two or more sub-runs have been performed, the tester may opt to calculate the mean velocity for each sub-run.

6.1.2 Using Equation 14-1, calculate the expected average velocity (v_d) in the sampling duct, corresponding to each value of v_m obtained under Section 6.1.1.

6.1.3 Calculate the actual average velocity (v_s) in the sampling duct for each run or sub-run, according to Equation 2-9 of Method 2, and using data obtained from Method 13.

6.1.4 Express each value v_s from Section 6.1.3 as a percentage of the corresponding v_d value from Section 6.1.2.

6.1.4.1 If v_s is less than or equal to 120 percent of v_d, the results are acceptable (note that in cases where the above calculations have been performed for each sub-run, the results are acceptable if the average percentage for all sub-runs is less than or equal to 120 percent).

6.1.4.2 If v_s is more than 120 percent of v_d, multiply the reported emission rate by the following factor.

$$1+\frac{(100\ v_s/v_d)-120}{200}$$

6.2 Average velocity of roof monitor gases. Calculate the average roof monitor velocity using all the velocity or volumetric flow readings from Section 5.1.2.

6.3 Roof monitor temperature. Calculate the mean value of the temperatures recorded in Section 5.2.

6.4 Concentration of fluorides in roof monitor air (in mg F/m³).

6.4.1 If a single sampling train was used throughout the run, calculate the average fluoride concentration for the roof monitor using Equation 13A-2 of Method 13A.

6.4.2 If two or more sampling trains were used (i.e., one per sub-run), calculate the average fluoride concentration for the run, as follows:

$$\bar{C}_s = \frac{\sum_{i=1}^{n} (F_t)_i}{\sum_{i=1}^{n} (V_{m(std)})_i} \qquad \text{(Equation 14-2)}$$

Where:

C_s=Average fluoride concentration in roof monitor air, mg F/dscm.

F_t=Total fluoride mass collected during a particular sub-run, mg F (from Equation 13A-1 of Method 13A or Equation 13B-1 of Method 13B).

$V_{m(std)}$=Total volume of sample gas passing through the dry gas meter during a particular sub-run, dscm (see Equation 5-1 of Method 5).

n=Total number of sub-runs.

6.5 Average volumetric flow from the roof monitor of the potroom(s) (or potroom segment(s)) containing the anemometers is given in Equation 14-3.

$$Q_m = \frac{v_{mt}(M_d)P_m(293°K)}{(T_m+273°)\ (760\ mm\ Hg)} \quad \text{(Equation 14-3)}$$

Where:

Q_m = Average volumetric flow from roof monitor at standard conditions on a dry basis, m^3/min.

A = Roof monitor open area, m^2.

v_{mt} = Average velocity of air in the roof monitor, m/min, from Section 6.2.

P_m = Pressure in the roof monitor; equal to barometric pressure for this application, mm Hg.

T_m = Roof monitor temperature, °C, from Section 6.3.

M_d = Mole fraction of dry gas, which is given by:

$$M_d = (1 - B_{ws})$$

NOTE: B_{ws} is the proportion by volume of water vapor in the gas stream, from Equation 5-3, Method 5.

7. *Bibliography.*

1. Shigehara, R. T., A guideline for Evaluating Compliance Test Results (Isokinetic Sampling Rate Criterion). U.S. Environmental Protection Agency, Emission Measurement Branch. Research Triangle Park, North Carolina, August 1977.

METHOD 15—DETERMINATION OF HYDROGEN SULFIDE, CARBONYL SULFIDE, AND CARBON DISULFIDE EMISSIONS FROM STATIONARY SOURCES

INTRODUCTION

The method described below uses the principle of gas chromatographic separation and flame photometric detection (FPD). Since there are many systems or sets of operating conditions that represent usable methods of determining sulfur emissions, all systems which employ this principle, but differ only in details of equipment and operation, may be used as alternative methods, provided that the criteria set below are met.

1. Principle and applicability

1.1 Principle. A gas sample is extracted from the emission source and diluted with clean dry air. An aliquot of the diluted sample is then analyzed for hydrogen sulfide (H_2S), carbonyl sulfide (COS), and carbon disulfide (CS_2) by gas chromatographic (GC) separation and flame photometric detection (FPD).

1.2 Applicability. This method is applicable for determination of the above sulfur compounds from tail gas control units of sulfur recovery plants.

2. Range and sensitivity

2.1 Range. Coupled with a gas chromtographic system utilizing a 1-milliliter sample size, the maximum limit of the FPD for each sulfur compound is approximately 10 ppm. It may be necessary to dilute gas samples from sulfur recovery plants hundredfold (99:1) resulting in an upper limit of about 1000 ppm for each compound.

2.2 The minimum detectable concentration of the FPD is also dependent on sample size and would be about 0.5 ppm for a 1 ml sample.

3. Interferences

3.1 Moisture Condensation. Moisture condensation in the sample delivery system, the analytical column, or the FPD burner block can cause losses or interferences. This potential is eliminated by heating the sample line, and by conditioning the sample with dry dilution air to lower its dew point below the operating temperature of the GC/FPD analytical system prior to analysis.

3.2 Carbon Monoxide and Carbon Dioxide. CO and CO_2 have substantial desensitizing effects on the flame photometric detector even after 9:1 dilution. (Acceptable systems must demonstrate that they have eliminated this interference by some procedure such as eluding CO and CO_2 before any of the sulfur compounds to be measured.) Compliance with this requirement can be demonstrated by submitting chromatograms of calibration gases with and without CO_2 in the diluent gas. The CO_2 level should be approximately 10 percent for the case with CO_2 present. The two chromatographs should show agreement within the precision limits of section 4.1.

3.3 Elemental Sulfur. The condensation of sulfur vapor in the sampling line can lead to eventual coating and even blockage of the sample line. This problem can be eliminated along with the moisture problem by heating the sample line.

4. Precision

4.1 Calibration Precision. A series of three consecutive injections of the same calibration gas, at any dilution, shall produce results which do not vary by more than ±13 percent from the mean of the three injections.

4.2 Calibration Drift. The calibration drift determined from the mean of three injections made at the beginning and end of any 8-hour period shall not exceed ±5 percent.

5. Apparatus

5.1.1 Probe. The probe must be made of inert material such as stainless steel or glass. It should be designed to incorporate a filter and to allow calibration gas to enter the probe at or near the sample entry point. Any portion of the probe not exposed to the stack gas must be heated to prevent moisture condensation.

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5.1.2 The sample line must be made of Teflon,[1] no greater than 1.3 cm (½ in) inside diameter. All parts from the probe to the dilution system must be thermostatically heated to 120° C.

5.1.3 Sample Pump. The sample pump shall be a leakless Teflon coated diaphragm type or equivalent. If the pump is upstream of the dilution system, the pump head must be heated to 120° C.

5.2 Dilution System. The dilution system must be constructed such that all sample contacts are made of inert material (e.g. stainless steel or Teflon). It must be heated to 120° C and be capable of approximately a 9:1 dilution of the sample.

5.3 Gas Chromatograph. The gas chromatograph must have at least the following components:

5.3.1 Oven. Capable of maintaining the separation column at the proper operating temperature ±1° C.

5.3.2 Temperature Gauge. To monitor column oven, detector, and exhaust temperature ±1° C.

5.3.3 Flow System. Gas metering system to measure sample, fuel, combustion gas, and carrier gas flows.

5.3.4 Flame Photometric Detector.

5.3.4.1 Electrometer. Capable of full scale amplification of linear ranges of 10^{-9} to 10^{-4} amperes full scale.

5.3.4.2 Power Supply. Capable of delivering up to 750 volts.

5.3.4.3 Recorder. Compatible with the output voltage range of the electrometer.

5.4 Gas Chromatograph Columns. The column system must be demonstrated to be capable of resolving three major reduced sulfur compounds: H_2S, COS, and CS_2.

To demonstrate that adequate resolution has been achieved the tester must submit a chromatograph of a calibration gas containing all three reduced sulfur compounds in the concentration range of the applicable standard. Adequate resolution will be defined as base line separation of adjacent peaks when the amplifier attenuation is set so that the smaller peak is at least 50 percent of full scale. Base line separation is defined as a return to zero ±5 percent in the interval between peaks. Systems not meeting this criteria may be considered alternate methods subject to the approval of the Administrator.

5.5.1 Calibration System. The calibration system must contain the following components.

5.5.2 Flow System. To measure air flow over permeation tubes at ±2 percent. Each flowmeter shall be calibrated after a complete test series with a wet test meter. If the flow measuring device differs from the wet test meter by 5 percent, the completed test shall be discarded. Alternatively, the tester may elect to use the flow data that would yield the lowest flow measurement. Calibration with a wet test meter before a test is optional.

5.5.3 Constant Temperature Bath. Device capable of maintaining the permeation tubes at the calibration temperature within ±1.1° C.

5.5.4 Temperature Gauge. Thermometer or equivalent to monitor bath temperature within ±1° C.

6. Reagents

6.1 Fuel. Hydrogen (H_2) prepurified grade or better.

6.2 Combustion Gas. Oxygen (O_2) or air, research purity or better.

6.3 Carrier Gas. Prepurified grade or better.

6.4 Diluent. Air containing less than 0.5 ppm total sulfur compounds and less than 10 ppm each of moisture and total hydrocarbons.

6.5 Calibration Gases. Permeation tubes, one each of H_2S, COS, and CS_2, gravimetrically calibrated and certified at some convenient operating temperature. These tubes consist of hermetically sealed FEP Teflon tubing in which a liquified gaseous substance is enclosed. The enclosed gas permeates through the tubing wall at a constant rate. When the temperature is constant, calibration gases covering a wide range of known concentrations can be generated by varying and accurately measuring the flow rate of diluent gas passing over the tubes. These calibration gases are used to calibrate the GC/FPD system and the dilution system.

7. Pretest Procedures

The following procedures are optional but would be helpful in preventing any problem which might occur later and invalidate the entire test.

7.1 After the complete measurement system has been set up at the site and deemed to be operational, the following procedures should be completed before sampling is initiated.

7.1.1 Leak Test. Appropriate leak test procedures should be employed to verify the integrity of all components, sample lines, and connections. The following leak test procedure is suggested: For components upstream of the sample pump, attach the probe end of the sample line to a manometer or vacuum gauge, start the pump and pull greater than 50 mm (2 in.) Hg vacuum, close off the pump outlet, and then stop the pump and ascertain that there is no leak for 1 minute. For components after the pump,

[1] Mention of trade names or specific products does not constitute an endorsement by the Environmental Protection Agency.

apply a slight positive pressure and check for leaks by applying a liquid (detergent in water, for example) at each joint. Bubbling indicates the presence of a leak.

7.1.2 System Performance. Since the complete system is calibrated following each test, the precise calibration of each component is not critical. However, these components should be verified to be operating properly. This verification can be performed by observing the response of flowmeters or of the GC output to changes in flow rates or calibration gas concentrations and ascertaining the response to be within predicted limits. If any component or the complete system fails to respond in a normal and predictable manner, the source of the discrepancy should be identifed and corrected before proceeding.

8. Calibration

Prior to any sampling run, calibrate the system using the following procedures. (If more than one run is performed during any 24-hour period, a calibration need not be performed prior to the second and any subsequent runs. The calibration must, however, be verified as prescribed in section 10, after the last run made within the 24-hour period.)

8.1 General Considerations. This section outlines steps to be followed for use of the GC/FPD and the dilution system. The procedure does not include detailed instructions because the operation of these systems is complex, and it requires an understanding of the individual system being used. Each system should include a written operating manual describing in detail the operating procedures associated with each component in the measurement system. In addition, the operator shuld be familiar with the operating principles of the components; particularly the GC/FPD. The citations in the Bibliography at the end of this method are recommended for review for this purpose.

8.2 Calibration Procedure. Insert the permeation tubes into the tube chamber. Check the bath temperature to assure agreement with the calibration temperature of the tubes within ±0.1°C. Allow 24 hours for the tubes to equilibrate. Alternatively equilibration may be verified by injecting samples of calibration gas at 1-hour intervals. The permeation tubes can be assumed to have reached equilibrium when consecutive hourly samples agree within the precision limits of section 4.1.

Vary the amount of air flowing over the tubes to produce the desired concentrations for calibrating the analytical and dilution systems. The air flow across the tubes must at all times exceed the flow requirement of the analytical systems. The concentration in parts per million generated by a bube containing a specific permeant can be calculated as follows:

$$C = K \times P_r / ML$$

Equation 15-1

where:

C = Concentration of permeant produced in ppm.

P_r = Permeation rate of the tube in μg/min.

M = Molecular weight of the permeant: g/g-mole.

L = Flow rate, l/min, of air over permeant @ 20°C, 760 mm Hg.

K = Gas constant at 20°C and 760 mm Hg = 24.04 l/g mole.

8.3 Calibration of analysis system. Generate a series of three or more known concentrations spanning the linear range of the FPD (approximately 0.05 to 1.0 ppm) for each of the four major sulfur compounds. Bypassing the dilution system, inject these standards in to the GC/FPD analyzers and monitor the responses. Three injects for each concentration must yield the precision described in section 4.1. Failure to attain this precision is an indication of a problem in the calibration or analytical system. Any such problem must be identified and corrected before proceeding.

8.4 Calibration Curves. Plot the GC/FPD response in current (amperes) versus their causative concentrations in ppm on log-log coordinate graph paper for each sulfur compound. Alternatively, a least squares equation may be generated from the calibration data.

8.5 Calibration of Dilution System. Generate a know concentration of hydrogen sulfied using the permeation tube system. Adjust the flow rate of diluent air for the first dilution stage so that the desired level of dilution is approximated. Inject the diluted calibration gas into the GC/FPD system and monitor its response. Three injections for each dilution must yield the precision described in section 4.1. Failure to attain this precision in this step is an indication of a problem in the dilution system. Any such problem must be identified and corrected before proceeding. Using the calibration data for H_2S (developed under 8.3) determine the diluted calibration gas concentration in ppm. Then calculate the dilution factor as the ratio of the calibration gas concentration before dilution to the diluted calibration gas concentration determined under this paragraph. Repeat this procedure for each stage of dilution required. Alternatively, the GC/FPD system may be calibrated by generating a series of three or more concentrations of each sulfur compound and diluting these samples before injecting them into the GC/FPD system. This data will then serve as the calibration data for the unknown samples and a separate determination of the dilution factor will not

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be necessary. However, the precision requirements of section 4.1 are still applicable.

9. Sampling and Analysis Procedure

9.1 Sampling. Insert the sampling probe into the test port making certain that no dilution air enters the stack through the port. Begin sampling and dilute the sample approximately 9:1 using the dilution system. Note that the precise dilution factor is that which is determined in paragraph 8.5. Condition the entire system with sample for a minimum of 15 minutes prior to commencing analysis.

9.2 Analysis. Aliquots of diluted sample are injected into the GC/FPD analyzer for analysis.

9.2.1 Sample Run. A sample run is composed of 16 individual analyses (injects) performed over a period of not less than 3 hours or more than 6 hours.

9.2.2 Observation for Clogging of Probe. If reductions in sample concentrations are observed during a sample run that cannot be explained by process conditions, the sampling must be interrupted to determine if the sample probe is clogged with particulate matter. If the probe is found to be clogged, the test must be stopped and the results up to that point discarded. Testing may resume after cleaning the probe or replacing it with a clean one. After each run, the sample probe must be inspected and, if necessary, dismantled and cleaned.

10. Post-Test Procedures

10.1 Sample Line Loss. A known concentration of hydrogen sulfide at the level of the applicable standard, ±20 percent, must be introduced into the sampling system at the opening of the probe in sufficient quantities to ensure that there is an excess of sample which must be vented to the atmosphere. The sample must be transported through the entire sampling system to the measurement system in the normal manner. The resulting measured concentration should be compared to the known value to determine the sampling system loss. A sampling system loss of more than 20 percent is unacceptable. Sampling losses of 0-20 percent must be corrected by dividing the resulting sample concentration by the fraction of recovery. The known gas sample may be generated using permeation tubes. Alternatively, cylinders of hydrogen sulfide mixed in air may be used provided they are traceable to permeation tubes. The optional pretest procedures provide a good guideline for determining if there are leaks in the sampling system.

10.2 Recalibration. After each run, or after a series of runs made within a 24-hour period, perform a partial recalibration using the procedures in section 8. Only H_2S (or other permeant) need be used to recalibrate the GC/FPD analysis system (8.3) and the dilution system (8.5).

10.3 Determination of Calibration Drift. Compare the calibration curves obtained prior to the runs, to the calibration curves obtained under paragraph 10.1. The calibration drift should not exceed the limits set forth in paragraph 4.2. If the drift exceeds this limit, the intervening run or runs should be considered not valid. The tester, however, may instead have the option of choosing the calibration data set which would give the highest sample values.

11. Calculations

11.1 Determine the concentrations of each reduced sulfur compound detected directly from the calibration curves. Alternatively, the concentrations may be calculated using the equation for the least squares line.

11.2 Calculation of SO_2 Equivalent. SO_2 equivalent will be determined for each analysis made by summing the concentrations of each reduced sulfur compound resolved during the given analysis.

$$SO_2 \text{ equivalent} = \Sigma(H_2S, COS, 2\,CS_2)d$$

Equation 15-2

where:

SO_2 equivalent = The sum of the concentration of each of the measured compounds (COS, H_2S, CS_2) expressed as sulfur dioxide in ppm.

H_2S = Hydrogen sulfide, ppm.

COS = Carbonyl sulfide, ppm.

CS_2 = Carbon disulfide, ppm.

d = Dilution factor, dimensionless.

11.3 Average SO_2 equivalent will be determined as follows:

$$\text{Average } SO_2 \text{ equivalent} = \frac{\sum_{i=1}^{N} SO_2 \text{ equiv.}_i}{N(1 - Bwo)}$$

Equation 15-3

where:

Average SO_2 equivalent$_i$ = Average SO_2 equivalent in ppm, dry basis.

Average SO_2 equivalent$_i$ = SO_2 in ppm as determined by Equation 15-2.

N = Number of analyses performed.

Bwo = Fraction of volume of water vapor in the gas stream as determined by Method 4—Determination of Moisture in Stack Gases (36 FR 24887).

12. Example System

Described below is a system utilized by EPA in gathering NSPS data. This system does not now reflect all the latest developments in equipment and column technology, but it does represent one system that has been demonstrated to work.

12.1 Apparatus.

12.1.1 Sample System.

12.1.1.1 Probe. Stainless steel tubing, 6.35 mm (¼ in.) outside diameter, packed with glass wool.

12.1.1.2 Sample Line. 3/16 inch inside diameter Teflon tubing heated to 120° C. This temperature is controlled by a thermostatic heater.

12.1.1.3 Sample Pump. Leakless Teflon coated diaphragm type or equivalent. The pump head is heated to 120° C by enclosing it in the sample dilution box (12.2.4 below).

12.1.2 Dilution System. A schematic diagram of the dynamic dilution system is given in Figure 15-2. The dilution system is constructed such that all sample contacts are made of inert materials. The dilution system which is heated to 120° C must be capable of a minimum of 9:1 dilution of sample. Equipment used in the dilution system is listed below:

12.1.2.1 Dilution Pump. Model A-150 Kohmyhr Teflon positive displacement type, nonadjustable 150 cc/min. ±2.0 percent, or equivalent, per dilution stage. A 9:1 dilution of sample is accomplished by combining 150 cc of sample with 1350 cc of clean dry air as shown in Figure 15-2.

12.1.2.2 Valves. Three-way Teflon solenoid or manual type.

12.1.2.3 Tubing. Teflon tubing and fittings are used throughout from the sample probe to the GC/FPD to present an inert surface for sample gas.

12.1.2.4 Box. Insulated box, heated and maintained at 120° C, of sufficient dimensions to house dilution apparatus.

12.1.2.5 Flowmeters. Rotameters or equivalent to measure flow from 0 to 1500 ml/min. ±1 percent per dilution stage.

12.1.3.0 Gas Chromatograph.

12.1.3.1 Column—1.83 m (6 ft.) length of Teflon tubing, 2.16 mm (0.085 in.) inside diameter, packed with deactivated silica gel, or equivalent.

12.1.3.2 Sample Valve. Teflon six port gas sampling valve, equipped with a 1 ml sample loop, actuated by compressed air (Figure 15-1).

12.1.3.3 Oven. For containing sample valve, stripper column and separation column. The oven should be capable of maintaining an elevated temperature ranging from ambient to 100° C, constant within ±1° C.

12.1.3.4 Temperature Monitor. Thermocouple pyrometer to measure column oven, detector, and exhaust temperature ±1° C.

12.1.3.5 Flow System. Gas metering system to measure sample flow, hydrogen flow, oxygen flow and nitrogen carrier gas flow.

12.1.3.6 Detector. Flame photometric detector.

12.1.3.7 Electrometer. Capable of full scale amplification of linear ranges of 10^{-9} to 10^{-4} amperes full scale.

12.1.3.8 Power Supply. Capable of delivering up to 750 volts.

12.1.3.9 Recorder. Compatible with the output voltage range of the electrometer.

12.1.4 Calibration. Permeation tube system (Figure 15-3).

12.1.4.1 Tube Chamber. Glass chamber of sufficient dimensions to house permeation tubes.

12.1.4.2 Mass Flowmeters. Two mass flowmeters in the range 0-3 l/min. and 0-10 l/min. to measure air flow over permeation tubes at ±2 percent. These flowmeters shall be cross-calibrated at the beginning of each test. Using a convenient flow rate in the measuring range of both flowmeters, set and monitor the flow rate of gas over the permeation tubes. Injection of calibration gas generated at this flow rate as measured by one flowmeter followed by injection of calibration gas at the same flow rate as measured by the other flowmeter should agree within the specified precision limits. If they do not, then there is a problem with the mass flow measurement. Each mass flowmeter shall be calibrated prior to the first test with a wet test meter and thereafter at least once each year.

12.1.4.3 Constant Temperature Bath. Capable of maintaining permeation tubes at certification temperature of 30° C within ±0.1° C.

12.2 Reagents.

12.2.1 Fuel. Hydrogen (H_2) prepurified grade or better.

12.2.2 Combustion Gas. Oxygen (O_2) research purity or better.

12.2.3 Carrier Gas. Nitrogen (N_2) prepurified grade or better.

12.2.4 Diluent. Air containing less than 0.5 ppm total sulfur compounds and less than 10 ppm each of moisture and total hydrocarbons, and filtered using MSA filters 46727 and 79030, or equivalent. Removal of sulfur compounds can be verified by injecting dilution air only, described in section 8.3.

12.2.5 Compressed Air. 60 psig for GC valve actuation.

12.2.6 Calibration Gases. Permeation tubes gravimetrically calibrated and certified at 30.0° C.

12.3 Operating Parameters. The operating parameters for the GC/FPD system are as follows: nitrogen carrier gas flow rate of 100 cc/min, exhaust temperature of 110° C, detector temperature 105° C, oven tempera-

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ture of 40° C, hydrogen flow rate of 80 cc/minute, oxygen flow rate of 20 cc/minute, and sample flow rate of 80 cc/minute.

12.4 Analysis. The sample valve is actuated for 1 minute in which time an aliquot of diluted sample is injected onto the separation column. The valve is then deactivated for the remainder of analysis cycle in which time the sample loop is refilled and the separation column continues to be foreflushed. The elution time for each compound will be determined during calibration.

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Method 16—Semicontinuous Determination of Sulfur Emissions From Stationary Sources

Introduction

The method described below uses the principle of gas chromatographic separation and flame photometric detection. Since there are many systems or sets of operating conditions that represent usable methods of determining sulfur emissions, all systems which employ this principle, but differ only in details of equipment and operation, may be used as alternative methods, provided that the criteria set below are met.

1. *Principle and Applicability.*

1.1 Principle. A gas sample is extracted from the emission source and diluted with clean dry air. An aliquot of the diluted sample is then analyzed for hydrogen sulfide (H_2S), methyl mercaptan (MeSH), dimethyl sulfide (DMS) and dimethyl disulfide (DMDS) by gas chromatographic (GC) separation and flame photometric detection (FPD). These four compounds are known collectively as total reduced sulfur (TRS).

1.2 Applicability. This method is applicable for determination of TRS compounds from recovery furnaces, lime kilns, and smelt dissolving tanks at kraft pulp mills.

2. *Range and Sensitivity.*

2.1 Range. Coupled with a gas chromatographic system utilizing a ten milliliter sample size, the maximum limit of the FPD for each sulfur compound is approximately 1 ppm. This limit is expanded by dilution of the sample gas before analysis. Kraft mill gas samples are normally diluted tenfold (9:1), resulting in an upper limit of about 10 ppm for each compound.

For sources with emission levels between 10 and 100 ppm, the measuring range can be best extended by reducing the sample size to 1 milliliter.

2.2 Using the sample size, the minimum detectable concentration is approximately 50 ppb.

3. *Interferences.*

3.1 Moisture Condensation. Moisture condensation in the sample delivery system, the analytical column, or the FPD burner block can cause losses or interferences. This potential is eliminated by heating the sample line, and by conditioning the sample with dry dilution air to lower its dew point below the operating temperature of the GC/FPD analytical system prior to analysis.

3.2 Carbon Monoxide and Carbon Dioxide. CO and CO_2 have substantial desensitizing effect on the flame photometric detector even after 9:1 dilution. Acceptable systems must demonstrate that they have eliminated this interference by some procedure such as eluting these compounds before any of the compounds to be measured. Compliance with this requirement can be demonstrated by submitting chromatograms of calibration gases with and without CO_2 in the diluent gas. The CO_2 level should be approximately 10 percent for the case with CO_2 present. The two chromatographs should show agreement within the precision limits of Section 4.1.

3.3 Particulate Matter. Particulate matter in gas samples can cause interference by eventual clogging of the analytical system. This interference must be eliminated by use of a probe filter.

3.4 Sulfur Dioxide. SO_2 is not a specific interferent but may be present in such large amounts that it cannot be effectively separated from other compounds of interest. The procedure must be designed to eliminate this problem either by the choice of separation columns or by removal of SO_2

from the sample. In the example system, SO_2 is removed by a citrate buffer solution prior to GC injection. This scrubber will be used when SO_2 levels are high enough to prevent baseline separation from the reduced sulfur compounds.

Compliance with this section can be demonstrated by submitting chromatographs of calibration gases with SO_2 present in the same quantities expected from the emission source to be tested. Acceptable systems shall show baseline separation with the amplifier attenuation set so that the reduced sulfur compound of concern is at least 50 percent of full scale. Base line separation is defined as a return to zero ± percent in the interval between peaks.

4. *Precision and Accuracy.*

4.1 GC/FPD and Dilution System Calibration Precision. A series of three consecutive injections of the same calibration gas, at any dilution, shall produce results which do not vary by more than ±5 percent from the mean of the three injections.

4.2 GC/FPD and Dilution System Calibration Drift. The calibration drift determined from the mean of three injections made at the beginning and end of any 8-hour period shall not exceed ± percent.

4.3 System Calibration Accuracy. Losses through the sample transport system must be measured and a correction factor developed to adjust the calibration accuracy to 100 percent.

5. *Apparatus* (See Figure 16-1).

5.1. Sampling.

5.1.1 Probe. The probe must be made of inert material such as stainless steel or glass. It should be designed to incorporate a filter and to allow calibration gas to enter the probe at or near the sample entry point. Any portion of the probe not exposed to the stack gas must be heated to prevent moisture condensation.

5.1.2 Sample Line. The sample line must be made of Teflon,[1] no greater than 1.3 cm (½) inside diameter. All parts from the probe to the dilution system must be thermostatically heated to 120° C.

5.1.3 Sample Pump. The sample pump shall be a leakless Teflon-coated diaphragm type or equivalent. If the pump is upstream of the dilution system, the pump head must be heated to 120° C.

5.2 Dilution System. The dilution system must be constructed such that all sample contacts are made of inert materials (e.g., stainless steel or Teflon). It must be heated to 120° C. and be capable of approximately a 9:1 dilution of the sample.

5.3 SO_2 Scrubber. The SO_2 Scrubber is a midget impinger packed with glass wool to eliminate entrained mist and charged with potassium citrate-citric acid buffer.

5.4 Gas Chromatograph. The gas chromatograph must have at least the following components:

5.4.1 Oven. Capable of maintaining the separation column at the proper operating temperature ±1° C.

5.4.2 Temperature Gauge. To monitor column oven, detector, and exhaust temperature ±1° C.

5.4.3 Flow System. Gas metering system to measure sample, fuel, combustion gas, and carrier gas flows.

5.4.4 Flame Photometric Detector.

5.4.4.1 Electrometer. Capable of full scale amplification of linear ranges of 10^{-9} to 10^{-4} amperes full scale.

5.4.4.2 Power Supply. Capable of delivering up to 750 volts.

5.4.4.3 Recorder. Compatible with the output voltage range of the electrometer.

5.5 Gas Chromatograph Columns. The column system must be demonstrated to be capble of resolving the four major reduced sulfur compounds: H_2S, MeSH, DMS, and DMDS. It must also demonstrate freedom from known inter

To demonstr uate resolution has been achie d, the te must submit a chromatograph of a calibration gas containing all four of the TRS compounds in the concentration range of the applicable standard. Adequate resolution will be defined as base line separation of adjacent peaks when the amplifier attenuation is set so that the smaller peak is at least 50 percent of full scale. Base line separation is defined in Section 3.4. Systems not meeting this criteria may be considered alternate methods subject to the approval of the Administrator.

5.6 Calibration System. The calibration system must contain the following components.

5.6.1 Tube Chamber. Chamber of glass or Teflon of sufficient dimensions to house permeation tubes.

5.6.2 Flow System. To measure air flow over permeation tubes at ±2 percent. Each flowmeter shall be calibrated after a complete test series with a wet test meter. If the flow measuring device differs from the wet test meter by 5 percent, the completed test shall be discarded. Alternatively, the tester may elect to use the flow data that would yield the lower flow measurement. Calibration with a wet test meter before a test is optional.

5.6.3 Constant Temperature Bath. Device capable of maintaining the permeation tubes at the calibration temperature within ±0.1° C.

5.6.4 Temperature Gauge. Thermometer or equivalent to monitor bath temperature within ±1° C.

6. *Reagents.*

[1]Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

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6.1 Fuel. Hydrogen (H_2) prepurified grade or better.

6.2 Combustion Gas. Oxygen (O_2) or air, research purity or better.

6.3 Carrier Gas. Prepurified grade or better.

6.4 Diluent. Air containing less than 50 ppb total sulfur compounds and less than 10 ppm each of moisture and total hydrocarbons. This gas must be heated prior to mixing with the sample to avoid water condensation at the point of contact.

6.5 Calibration Gases. Permeation tubes, one each of H_2S, MeSH, DMS, and DMDS, agravimetrically calibrated and certified at some convenient operating temperature. These tubes consist of hermetically sealed FEP Teflon tubing in which a liquified gaseous substance is enclosed. The enclosed gas permeates through the tubing wall at a constant rate. When the temperature is constant, calibration gases covering a wide range of known concentrations can be generated by varying and accurately measuring the flow rate of diluent gas passing over the tubes. These calibration gases are used to calibrate the GC/FPD system and the dilution system.

6.6 Citrate Buffer. Dissolve 300 grams of potassium citrate and 41 grams of anhydrous citric acid in 1 liter of deionized water. 284 grams of sodium citrate may be substituted for the potassium citrate.

7. *Pretest Procedures.* The following procedures are optional but would be helpful in preventing any problem which might occur later and invalidate the entire test.

7.1 After the complete measurement system has been set up at the site and deemed to be operational, the following procedures should be completed before sampling is initiated.

7.1.1 Leak Test. Appropriate leak test procedures should be employed to verify the integrity of all components, sample lines, and connections. The following leak test procedure is suggested: For components upstream of the sample pump, attach the probe end of the sample line to a manometer or vacuum gauge, start the pump and pull greater than 50 mm (2 in.) Hg vacuum, close off the pump outlet, and then stop the pump and ascertain that there is no leak for 1 minute. For components after the pump, apply a slight positive pressure and check for leaks by applying a liquid (detergent in water, for example) at each joint. Bubbling indicates the presence of a leak.

7.1.2 System Performance. Since the complete system is calibrated following each test, the precise calibration of each component is not critical. However, these components should be verified to be operating properly. This verification can be performed by observing the response of flowmeters or of the GC output to changes in flow rates or calibration gas concentrations and ascertaining the response to be within predicted limits. In any component, or if the complete system fails to respond in a normal and predictable manner, the source of the discrepancy should be identified and corrected before proceeding.

8. *Calibration.* Prior to any sampling run, calibrate the system using the following procedures. (If more than one run is performed during any 24-hour period, a calibration need not be performed prior to the second and any subsequent runs. The calibration must, however, be verified as prescribed in Section 10, after the last run made within the 24-hour period.)

8.1 General Considerations. This section outlines steps to be followed for use of the GC/FPD and the dilution system. The procedure does not include detailed instructions because the operation of these systems is complex, and it requires a understanding of the individual system being used. Each system should include a written operating manual describing in detail the operating procedures associated with each component in the measurement system. In addition, the operator should be familiar with the operating principles of the components; particularly the GC/FPD. The citations in the Bibliography at the end of this method are recommended for review for this purpose.

8.2 Calibration Procedure. Insert the permeation tubes into the tube chamber. Check the bath temperature to assure agreement with the calibration temperature of the tubes within ±0.1° C. Allow 24 hours for the tubes to equilibrate. Alternatively equilibration may be verified by injecting samples of calibration gas at 1-hour intervals. The permeation tubes can be assumed to have reached equilibrium when consecutive hourly samples agree within the precision limits of Section 4.1.

Vary the amount of air flowing over the tubes to produce the desired concentrations for calibrating the analytical and dilution systems. The air flow across the tubes must at all times exceed the flow requirement of the analytical systems. The concentration in parts per million generated by a tube containing a specific permeant can be calculated as follows:

$$C = K \frac{P_r}{ML}$$

Equation 16-1

where:

C = Concentration of permeant produced in ppm.

P_r = Permeation rate of the tube in μg/min.

M=Molecular weight of the permeant (g/g-mole).
L=Flow rate, l/min, of air over permeant @ 20° C, 760 mm Hg.
K=Gas constant at 20° C and 760 mm Hg=24.04 l/g mole.

8.3 Calibration of analysis system. Generate a series of three or more known concentrations spanning the linear range of the FPD (approximately 0.05 to 1.0 ppm) for each of the four major sulfur compounds. Bypassing the dilution system, but using the SO_2 scrubber, inject these standards into the GC/FPD analyzers and monitor the responses. Three injects for each concentration must yield the precision described in Section 4.1. Failure to attain this precision is an indication of a problem in the calibration or analytical system. Any such problem must be identified and corrected before proceeding.

8.4 Calibration Curves. Plot the GC/FPD response in current (amperes) versus their causative concentrations in ppm on log-log coordinate graph paper for each sulfur compound. Alternatively, a least squares equation may be generated from the calibration data.

8.5 Calibration of Dilution System. Generate a known concentration of hydrogen sulfide using the permeation tube system. Adjust the flow rate of diluent air for the first dilution stage so that the desired level of dilution is approximated. Inject the diluted calibration gas into the GC/FPD system and monitor its response. Three injections for each dilution must yield the precision described in Section 4.1. Failure to attain this precision in this step is an indication of a problem in the dilution system. Any such problem must be identified and corrected before proceeding. Using the calibration data for H_2S (developed under 8.3) determine the diluted calibration gas concentration in ppm. Then calculate the dilution factor as the ratio of the calibration gas concentration before dilution to the diluted calibration gas concentration determined under this paragraph. Repeat this procedure for each stage of dilution required. Alternatively, the GC/FPD system may be calibrated by generating a series of three or more concentrations of each sulfur compound and diluting these samples before injecting them into the GC/FPD system. This data will then serve as the calibration data for the unknown samples and a separate determination of the dilution factor will not be necessary. However, the precision requirements of Section 4.1 are still applicable.

9. *Sampling and Analysis Procedure.*

9.1 Sampling. Insert the sampling probe into the test port making certain that no dilution air enters the stack through the port. Begin sampling and dilute the sample approximtely 9:1 using the dilution system. Note that the precise dilution factor is that which is determined in paragraph 8.5. Condition the entire system with sample for a minimum of 15 minutes prior to commencing analysis.

9.2 Analysis. Aliquots of diluted sample pass through the SO_2 scrubber, and then are injected into the GC/FPD analyzer for analysis.

9.2.1 Sample Run. A sample run is composed of 16 individual analyses (injects) performed over a period of not less than 3 hours or more than 6 hours.

9.2.2 Observation for Clogging of Probe. If reductions in sample concentrations are observed during a sample run that cannot be explained by process conditions, the sampling must be interrupted to determine if the sample probe is clogged with particulate matter. If the probe is found to be clogged, the test must be stopped and the results up to that point discarded. Testing may resume after cleaning the probe or replacing it with a clean one. After each run, the sample probe must be inspected and, if necessary, dismantled and cleaned.

10. *Post-Test Procedures.*

10.1 Sample line loss. A known concentration of hydrogen sulfide at the level of the applicable standard, ±20 percent, must be introduced into the sampling system in sufficient quantities to insure that there is an excess of sample which must be vented to the atmosphere. The sample must be introduced immediately after the probe and filter and transported through the remainder of the sampling system to the measurement system in the normal manner. The resulting measured concentration should be compared to the known value to determine the sampling system loss.

For sampling losses greater than 20 percent in a sample run, the sample run is not to be used when determining the arithmetic mean of the performance test. For sampling losses of 0–20 percent, the sample concentration must be corrected by dividing the sample concentration by the fraction of recovery. The fraction of recovery is equal to one minus the ratio of the measured concentration to the known concentration of hydrogen sulfide in the sample line loss procedure. The known gas sample may be generated using permeation tubes. Alternatively, cylinders of hydrogen sulfide mixed in air may be used provided they are traceable to permeation tubes. The optional pretest procedures provide a good guideline for determining if there are leaks in the sampling system.

10.2 Recalibration. After each run, or after a series of runs made within a 24-hour period, perform a partial recalibration using the procedures in Section 8. Only H_2S (or other permeant) need be used to recalibrate

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the GC/FPD analysis system (8.3) and the dilution system (8.5).

10.3 Determination of Calibration Drift. Compare the calibration curves obtained prior to the runs, to the calibration curves obtained under paragraph 10.1. The calibration drift should not exceed the limits set forth in subsection 4.2. If the drift exceeds this limit, the intervening run or runs should be considered not valid. The tester, however, may instead have the option of choosing the calibration data set which would give the highest sample values.

11. *Calculations.*

11.1 Determine the concentrations of each reduced sulfur compound detected directly from the calibration curves. Alternatively, the concentrations may be calculated using the equation for the least square line.

11.2 Calculation of TRS. Total reduced sulfur will be determined for each anaylsis made by summing the concentrations of each reduced sulfur compound resolved during a given analysis.

$$TRS = \Sigma\ (H_2S, MeSH, DMS, 2DMDS)d$$

Equation 16-2

where:

TRS = Total reduced sulfur in ppm, wet basis.
H_2S = Hydrogen sulfide, ppm.
MeSH = Methyl mercaptan, ppm.
DMS = Dimethyl sulfide, ppm.
DMDS = Dimethyl disulfide, ppm.
d = Dilution factor, dimensionless.

11.3 Average TRS. The average TRS will be determined as follows:

Average TRS =

$$\text{Average TRS} = \frac{\sum_{i=1}^{N} TRS_i}{N(1-B_{wo})}$$

Average TRS = Average total reduced suflur in ppm, dry basis.
TRS_i = Total reduced sulfur in ppm as determined by Equation 16-2.
N = Number of samples.
B_{wo} = Fraction of volume of water vapor in the gas stream as determined by reference method 4—Determination of Moisture in Stack Gases (36 FR 24887).

11.4 Average concentration of individual reduced sulfur compounds.

$$C = \frac{\sum_{i=1}^{N} S_i}{N}$$

Equation 16-3

where:

S_i = Concentration of any reduced sulfur compound from the ith sample injection, ppm.
C = Average concentration of any one of the reduced sulfur compounds for the entire run, ppm.
N = Number of injections in any run period.

12. *Example System.* Described below is a system utilized by EPA in gathering NSPS data. This system does not now reflect all the latest developments in equipment and column technology, but it does represent one system that has been demonstrated to work.

12.1 Apparatus.

12.1.1 Sampling System.

12.1.1.1 Probe. Figure 16-1 illustrates the probe used in lime kilns and other sources where significant amounts of particulate matter are present. the probe is designed with the deflector shield placed between the sample and the gas inlet holes and the glass wool plugs to reduce clogging of the filter and possible adsorption of sample gas. The exposed portion of the probe between the sampling port and the sample line is heated with heating tape.

12.1.1.2 Sample Line $\frac{3}{8}$ inch inside diameter Teflon tubing, heated to 120° C. This temperature is controlled by a thermostatic heater.

12.1.1.3 Sample Pump. Leakless Teflon coated diaphragm type or equivalent. The pump head is heated to 120° C by enclosing it in the sample dilution box (12.1.2.4 below).

12.1.2 Dilution System. A schematic diagram of the dynamic dilution system is given in Figure 16-2. The dilution system is constructed such that all sample contacts are made of inert materials. The dilution system which is heated to 120° C must be capable of a minimum of 9:1 dilution of sample. Equipment used in the dilution system is listed below:

12.1.2.1 Dilution Pump. Model A-150 Kohmyhr Teflon positive displacement type, nonadjustable 150 cc/min. ±2.0 percent, or equivalent, per dilution stage. A 9:1 dilution of sample is accomplished by combining 150 cc of sample with 1,350 cc of clean dry air as shown in Figure 16-2.

12.1.2.2 Valves. Three-way Teflon solenoid or manual type.

12.1.2.3 Tubing. Teflon tubing and fittings are used throughout from the sample probe to the GC/FPD to present an inert surface for sample gas.

12.1.2.4 Box. Insulated box, heated and maintained at 120° C, of sufficient dimensions to house dilution apparatus.

12.1.2.5 Flowmeters. Rotameters or equivalent to measure flow from 0 to 1500 ml/min ±1 percent per dilution stage.

12.1.3 SO_2 Scrubber. Midget impinger with 15 ml of potassium citrate buffer to absorb SO_2 in the sample.

12.1.4 Gas Chromatograph Columns. Two types of columns are used for separation of low and high molecular weight sulfur compounds:

12.1.4.1 Low Molecular Weight Sulfur Compounds Column (GC/FPD-I).

12.1.4.1.1 Separation Column. 11 m by 2.16 mm (36 ft by 0.085 in) inside diameter Teflon tubing packed with 30/60 mesh Teflon coated with 5 percent polyphenyl ether and 0.05 percent orthophosphoric acid, or equivalent (see Figure 16-3).

12.1.4.1.2 Stripper or Precolumn. 0.6 m by 2.16 mm (2 ft by 0.085 in) inside diameter Teflon tubing.

12.1.4.1.3 Sample Valve. Teflon 10-port gas sampling valve, equipped with a 10 ml sample loop, actuated by compressed air (Figure 16-3).

12.1.4.1.4 Oven. For containing sample valve, stripper column and separation column. The oven should be capable of maintaining an elevated temperature ranging from ambient to 100° C, constant within ±1° C.

12.1.4.1.5 Temperature Monitor. Thermocouple pyrometer to measure column oven, detector, and exhaust temperature ±1° C.

12.1.4.1.6 Flow System. Gas metering system to measure sample flow, hydrogen flow, and oxygen flow (and nitrogen carrier gas flow).

12.1.4.1.7 Detector. Flame photometric detector.

12.1.4.1.8 Electrometer. Capable of full scale amplification of linear ranges of 10^{-9} to 10^{-4} amperes full scale.

12.1.4.1.9 Power Supply. Capable of delivering up to 750 volts.

12.1.4.1.10 Recorder. Compatible with the output voltage range of the electrometer.

12.1.4.2 High Molecular Weight Compounds Column (GC/FPD-II).

12.1.4.2.1 Separation Column. 3.05 m by 2.16 mm (10 ft by 0.0885 in) inside diameter Teflon tubing packed with 30/60 mesh Teflon coated with 10 percent Triton X-305, or equivalent.

12.1.4.2.2 Sample Valve. Teflon 6-port gas sampling valve equipped with a 10 ml sample loop, actuated by compressed air (Figure 16-3).

12.1.4.2.3 Other Components. All components same as in 12.1.4.1.5 to 12.1.4.1.10.

12.1.5 Calibration. Permeation tube system (figure 16-4).

12.1.5.1 Tube Chamber. Glass chamber of sufficient dimensions to house permeation tubes.

12.1.5.2 Mass Flowmeters. Two mass flowmeters in the range 0-3 l/min. and 0-10 l/min. to measure air flow over permeation tubes at ±2 percent. These flowmeters shall be cross-calibrated at the beginning of each test. Using a convenient flow rate in the measuring range of both flowmeters, set and monitor the flow rate of gas over the permeation tubes. Injection of calibration gas generated at this flow rate as measured by one flowmeter followed by injection of calibration gas at the same flow rate as measured by the other flowmeter should agree within the specified precision limits. If they do not, then there is a problem with the mass flow measurement. Each mass flowmeter shall be calibrated prior to the first test with a wet test meter and thereafter, at least once each year.

12.1.5.3 Constant Temperature Bath. Capable of maintaining permeation tubes at certification temperature of 30° C. within ±0.1° C.

12.2 Reagents

12.2.1 Fuel. Hydrogen (H_2) prepurified grade or better.

12.2.2. Combustion Gas. Oxygen (O_2) research purity or better.

12.2.3 Carrier Gas. Nitrogen (N_2) prepurified grade or better.

12.2.4 Diluent. Air containing less than 50 ppb total sulfur compounds and less than 10 ppm each of moisture and total hydrocarbons, and filtered using MSA filters 46727 and 79030, or equivalent. Removal of sulfur compounds can be verified by injecting dilution air only, described in Section 8.3.

12.2.5 Compressed Air. 60 psig for GC valve actuation.

12.2.6 Calibrated Gases. Permeation tubes gravimetrically calibrated and certified at 30.0° C.

12.2.7 Citrate Buffer. Dissolve 300 grams of potassium citrate and 41 grams of anhydrous citric acid in 1 liter of deionized water. 284 grams of sodium citrate may be substituted for the potassium citrate.

12.3 Operating Parameters.

12.3.1 Low-Molecular Weight Sulfur Compounds. The operating parameters for the GC/FPD system used for low molecular weight compounds are as follows: nitrogen carrier gas flow rate of 50 cc/min, exhaust temperature of 110° C, detector temperature of 105° C, oven temperature of 40° C, hydrogen flow rate of 80 cc/min, oxygen flow rate of 20 cc/min, and sample flow rate between 20 and 80 cc/min.

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12.3.2 High-Molecular Weight Sulfur Compounds. The operating parameters for the GC/FPD system for high molecular weight compounds are the same as in 12.3.1 except: oven temperature of 70° C, and nitrogen carrier gas flow of 100 cc/min.

12.4 Analysis Procedure.

12.4.1 Analysis. Aliquots of diluted sample are injected simultaneously into both GC/FPD analyzers for analysis. GC/FPD-I is used to measure the low-molecular weight reduced sulfur compounds. The low molecular weight compounds include hydrogen sulfide, methyl mercaptan, and dimethyl sulfide. GC/FPD-II is used to resolve the high-molecular weight compound. The high-molecular weight compound is dimethyl disulfide.

12.4.1.1 Analysis of Low-Molecular Weight Sulfur Compounds. The sample valve is actuated for 3 minutes in which time an aliquot of diluted sample is injected into the stripper column and analytical column. The valve is then deactivated for approximately 12 minutes in which time, the analytical column continues to be foreflushed, the stripper column is backflushed, and the sample loop is refilled. Monitor the responses. The elution time for each compound will be determined during calibration.

12.4.1.2 Analysis of High-Molecular Weight Sulfur Compounds. The procedure is essentially the same as above except that no stripper column is needed.

13. *Bibliography.*

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13.4 Devonald, R. H., R. S. Serenius, and A. D. McIntyre. "Evaluation of the Flame Photometric Detector for Analysis of Sulfur Compounds." Pulp and Paper Magazine of Canada, 73,3 (March, 1972).

13.5 Grimley, K. W., W. S. Smith, and R. M. Martin. "The Use of a Dynamic Dilution System in the Conditioning of Stack Gases for Automated Analysis by a Mobile Sampling Van." Presented at the 63rd Annual APCA Meeting in St. Louis, Mo. June 14-19, 1970.

13.6 General Reference. Standard Methods of Chemical Analysis Volume III A and B Instrumental Methods. Sixth Edition. Van Nostrand Reinhold Co.

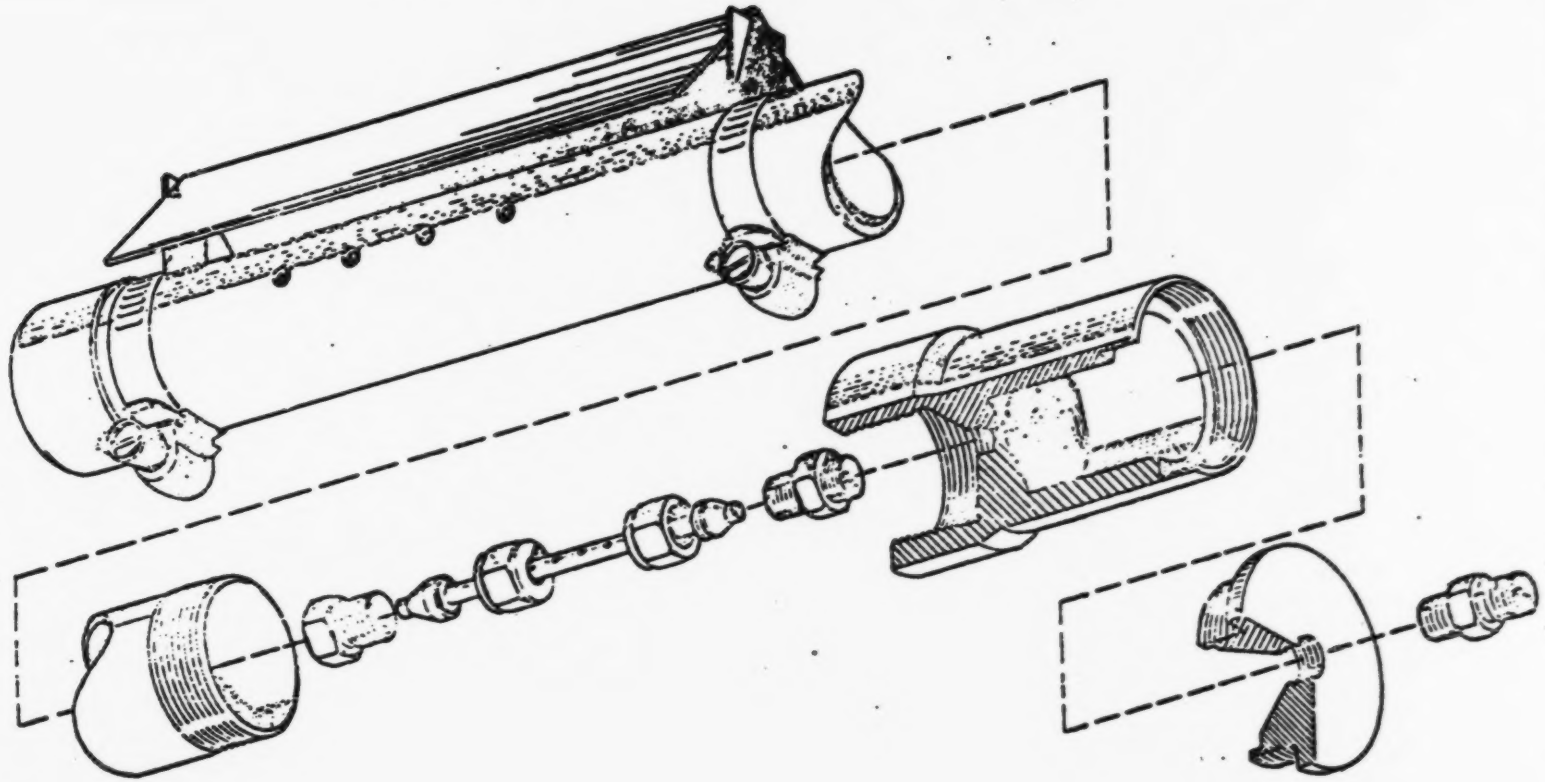

Figure 16-1. Probe used for sample gas containing high particulate loadings.

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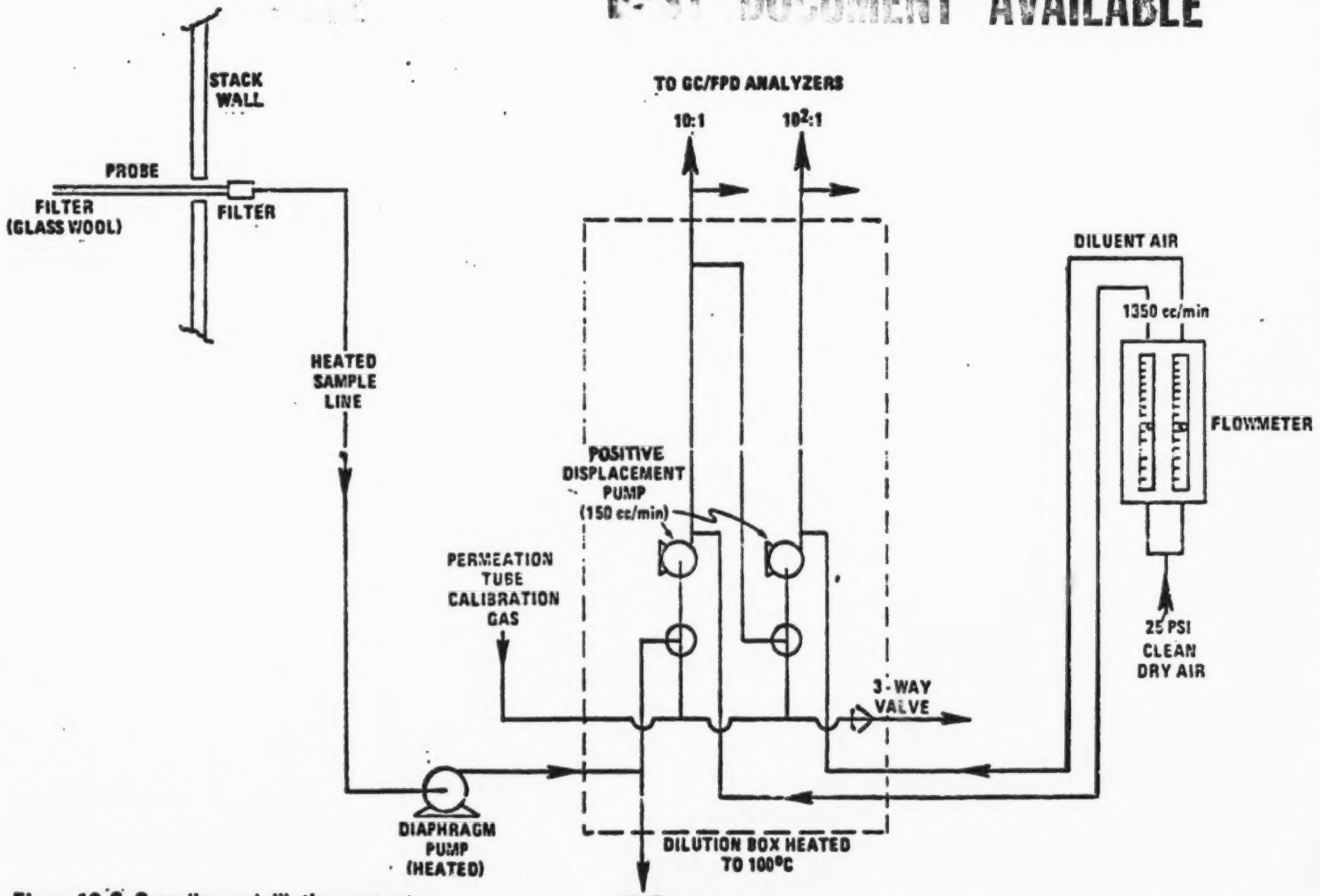

Figure 16-2. Sampling and dilution apparatus.

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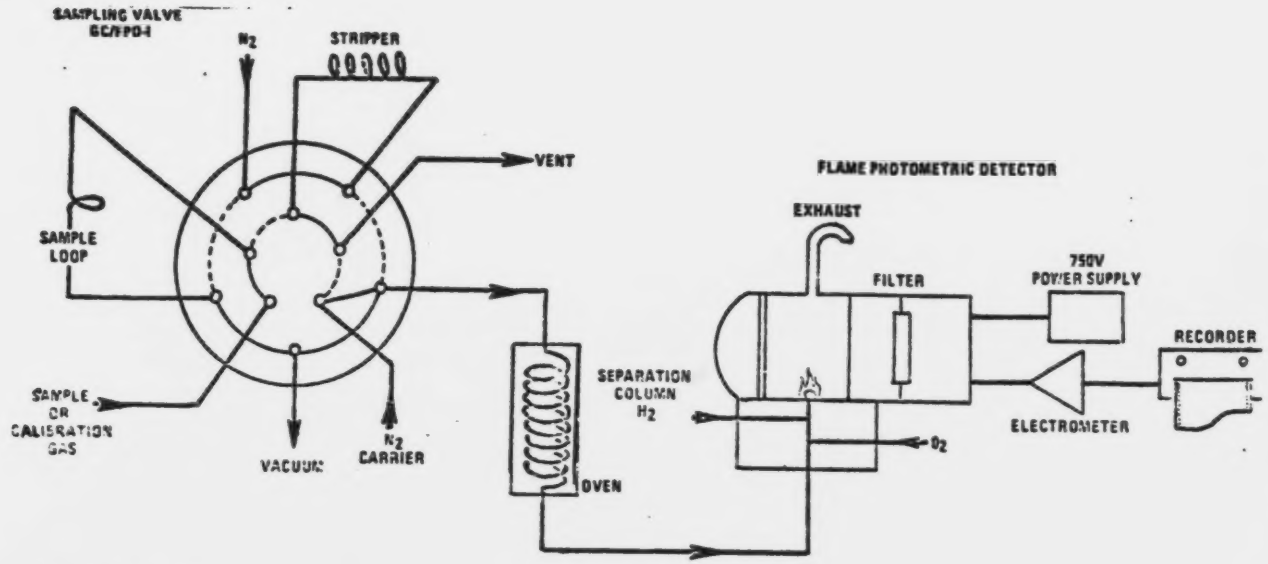

Figure 16-3. Gas chromatographic-flame photometric analyzers.

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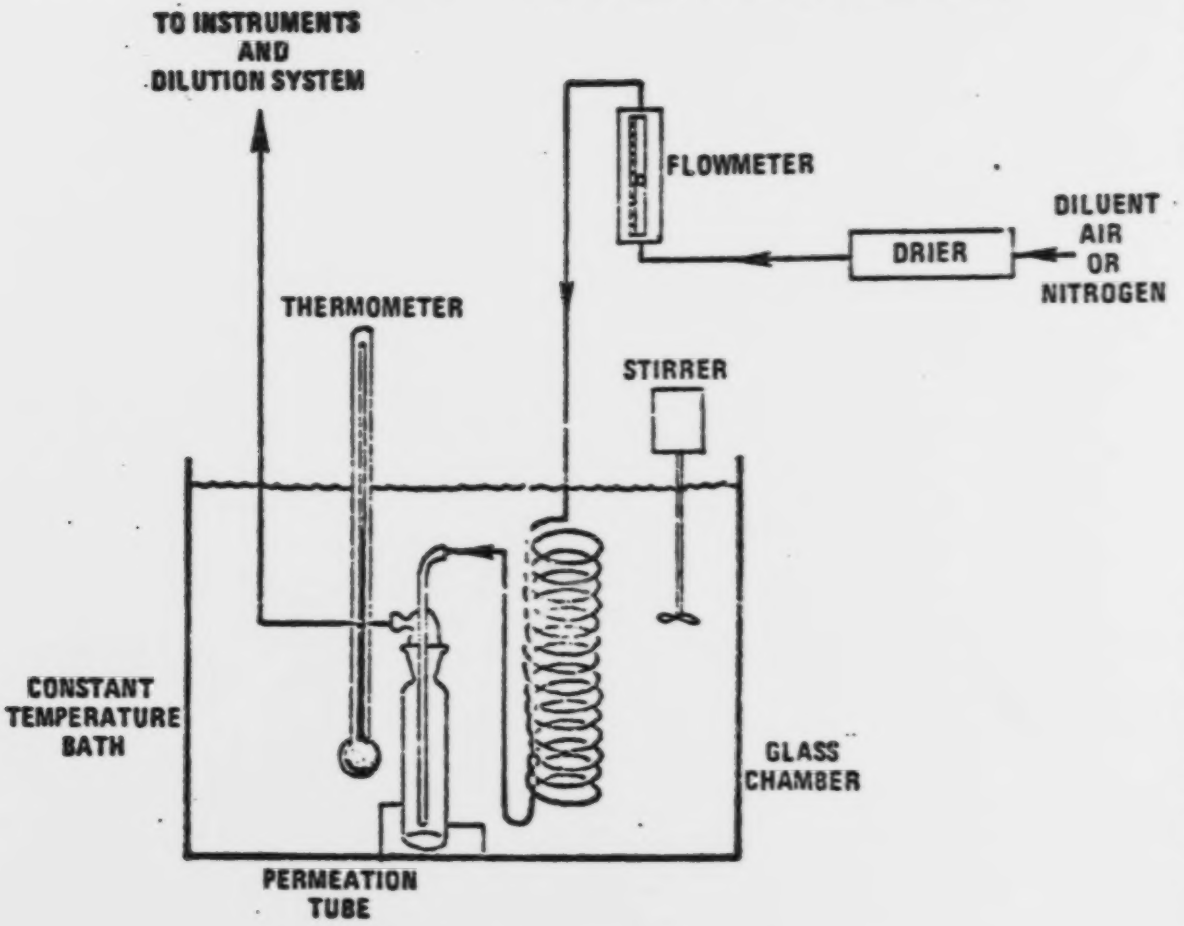

Figure 16-4. Apparatus for field calibration.

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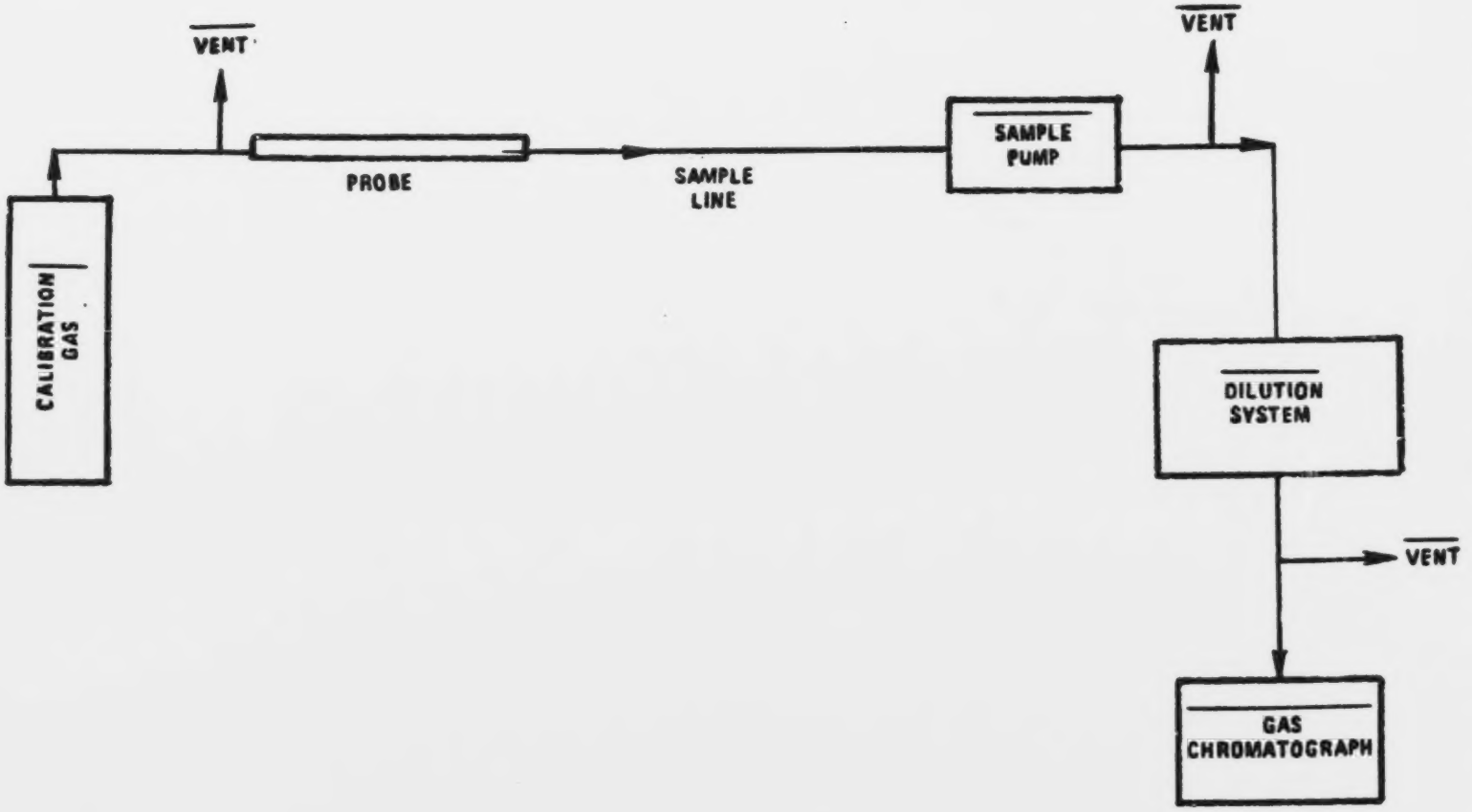

Figure 16- 5. Determination of sample line loss.

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METHOD 17—DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES (IN-STACK FILTRATION METHOD)

Introduction

Particulate matter is not an absolute quantity; rather, it is a function of temperature and pressure. Therefore, to prevent variability in particulate matter emission regulations and/or associated test methods, the temperature and pressure at which particulate matter is to be measured must be carefully defined. Of the two variables (i.e., temperature and pressure), temperature has the greater effect upon the amount of particulate matter in an effluent gas stream; in most stationary source categories, the effect of pressure appears to be negligible.

In method 5, 250° F is established as a nominal reference temperature. Thus, where Method 5 is specified in an applicable subpart of the standards, particulate matter is defined with respect to temperature. In order to maintain a collection temperature of 250° F, Method 5 employs a heated glass sample probe and a heated filter holder. This equipment is somewhat cumbersome and requires care in its operation. Therefore, where particulate matter concentrations (over the normal range of temperature associated with a specified source category) are known to be independent of temperature, it is desirable to eliminate the glass probe and heating systems, and sample at stack temperature.

This method describes an in-stack sampling system and sampling procedures for use in such cases. It is intended to be used only when specified by an applicable subpart of the standards, and only within the applicable temperature limits (if specified), or when otherwise approved by the Administrator.

1. *Principle and Applicability.*

1.1 Principle. Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at stack temperature. The particulate mass is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method applies to the determination of particulate emissions from stationary sources for determining compliance with new source performance standards, only when specifically provided for in an applicable subpart of the standards. This method is not applicable to stacks that contain liquid droplets or are saturated with water vapor. In addition, this method shall not be used as written if the projected cross-sectional area of the probe extension-filter holder assembly covers more than 5 percent of the stack cross-sectional area (see Section 4.1.2).

2. *Apparatus.*

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 17-1. Construction details for many, but not all, of the train components are given in APTD-0581 (Citation 2 in Section 7); for changes from the APTD-0581 document and for allowable modifications to Figure 17-1, consult with the Administrator.

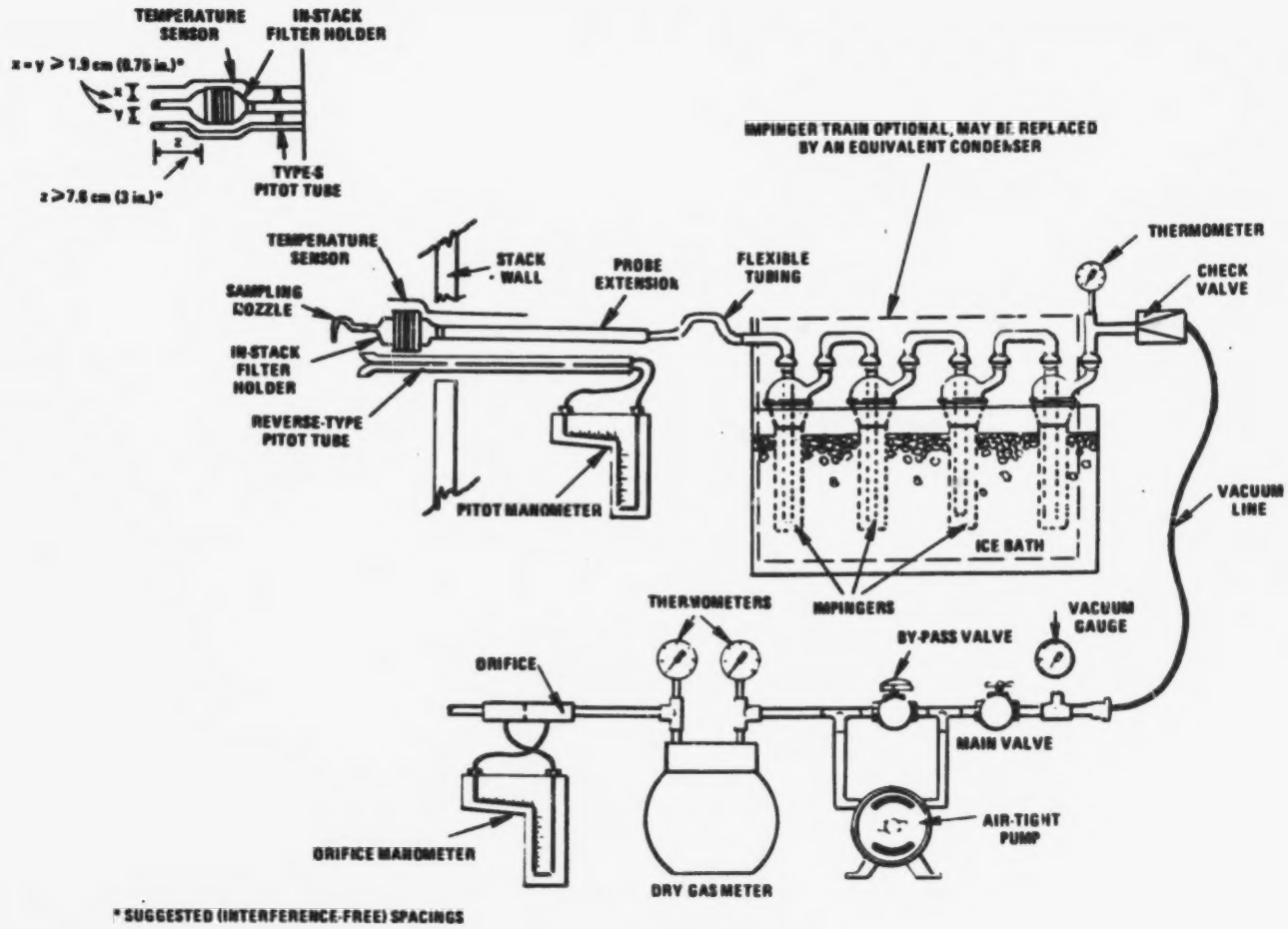

Figure 17-1. Particulate-Sampling Train, Equipped with In-Stack Filter.

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The operating and maintenance procedures for many of the sampling train components are described in APTD-0576 (Citation 3 in Section 7). Since correct usage is important in obtaining valid results, all users should read the APTD-0576 document and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass, with sharp, tapered leading edge. The angle of taper shall be 30° and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing. Other materials of construction may be used subject to the approval of the Administrator.

A range of sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (⅛ to ½ in)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in). Each nozzle shall be calibrated according to the procedures outlined in Section 5.1.

2.1.2 Filter Holder. The in-stack filter holder shall be constructed of borosilicate or quartz glass, or stainless steel; if a gasket is used, it shall be made of silicone rubber, Teflon, or stainless steel. Other holder and gasket materials may be used subject to the approval of the Administrator. The filter holder shall be designed to provide a positive seal against leakage from the outside or around the filter.

2.1.3 Probe Extension. Any suitable rigid probe extension may be used after the filter holder.

2.1.4 Pitot Tube. Type S, as described in Section 2.1 of Method 2, or other device approved by the Administrator; the pitot tube shall be attached to the probe extension to allow constant monitoring of the stack gas velocity (see Figure 17-1). The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane during sampling (see Method 2, Figure 2-6b). It is recommended: (1) that the pitot tube have a known baseline coefficient, determined as outlined in Section 4 of Method 2; and (2) that this known coefficient be preserved by placing the pitot tube in an interference-free arrangement with respect to the sampling nozzle, filter holder, and temperature sensor (see Figure 17-1). Note that the 1.9 cm (0.75 in) free-space between the nozzle and pitot tube shown in Figure 17-1, is based on a 1.3 cm (0.5 in) ID nozzle. If the sampling train is designed for sampling at higher flow rates than that described in APTD-0581, thus necessitating the use of larger sized nozzles, the free-space shall be 1.9 cm (0.75 in) with the largest sized nozzle in place.

Source-sampling assemblies that do not meet the minimum spacing requirements of Figure 17-1 (or the equivalent of these requirements, e.g., Figure 2-7 of Method 2) may be used; however, the pitot tube coefficients of such assemblies shall be determined by calibration, using methods subject to the approval of the Administrator.

2.1.5 Differential Pressure Gauge. Inclined manometer or equivalent device (two), as described in Section 2.2 of Method 2. One manometer shall be used for velocity head (Δp) readings, and the other, for orifice differential pressure readings.

2.1.6 Condenser. It is recommended that the impinger system described in Method 5 be used to determine the moisture content of the stack gas. Alternatively, any system that allows measurement of both the water condensed and the moisture leaving the condenser, each to within 1 ml or 1 g, may be used. The moisture leaving the condenser can be measured either by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures; or (2) passing the sample gas stream through a silica gel trap with exit gases kept below 20° C (68° F) and determining the weight gain.

Flexible tubing may be used between the probe extension and condenser. If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

2.1.7 Metering System. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3° C (5.4° F), dry gas meter capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 17-1. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall enable checks of isokinetic rates.

Sampling trains utilizing metering systems designed for higher flow rates than that described in APTD-0581 or APTD-0576 may be used provided that the specifications of this method are met.

2.1.8 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case

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the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.9 Gas Density Determination Equipment. Temperature sensor and pressure gauge, as described in Sections 2.3 and 2.4 of Method 2, and gas analyzer, if necessary, as described in Method 3.

The temperature sensor shall be attached to either the pitot tube or to the probe extension, in a fixed configuration. If the temperature sensor is attached in the field; the sensor shall be placed in an interference-free arrangement with respect to the Type S pitot tube openings (as shown in Figure 17-1 or in Figure 2-7 of Method 2). Alternatively, the temperature sensor need not be attached tc either the probe extension or pitot tube during sampling, provided that a difference of not more than 1 percent in the average velocity measurement is introduced. This alternative is subject to the approval of the Administrator.

2.2 Sample Recovery.

2.2.1 Probe Nozzle Brush. Nylon bristle brush with stainless steel wire handle. The brush shall be properly sized and shaped to brush out the probe nozzle.

2.2.2 Wash Bottles—Two. Glass wash bottles are recommended; polyethylene wash bottles may be used at the option of the tester. It is recommended that acetone not be stored in polyethylene bottles for longer than a month.

2.2.3 Glass Sample Storage Containers. Chemically resistant, borosilicate glass bottles, for acetone washes, 500 ml or 1000 ml. Screw cap liners shall either be rubber-backed Teflon or shall be constructed so as to be leak-free and resistant to chemical attack by acetone. (Narrow mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

2.2.4 Petri Dishes. For filter samples; glass or polyethylene, unless otherwise specified by the Administrator.

2.2.5 Graduated Cylinder and/or Balance. To measure condensed water to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. Any of these balances is suitable for use here and in Section 2.3.4.

2.2.6 Plastic Storage Containers. Air tight containers to store silica gel.

2.2.7 Funnel and Rubber Policeman. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

2.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

2.3 Analysis.

2.3.1 Glass Weighing Dishes.

2.3.2 Desiccator.

2.3.3 Analytical Balance. To measure to within 0.1 mg.

2.3.4 Balance. To measure to within 0.5 mg.

2.3.5 Beakers. 250 ml.

2.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

2.3.7 Temperature Gauge. To measure the temperature of the laboratory environment.

3. *Reagents.*

3.1 Sampling.

3.1.1 Filters. The in-stack filters shall be glass mats or thimble fiber filters, without organic binders, and shall exhibit at least 99.95 percent efficiency (0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency tests shall be conducted in accordance with ASTM standard method D 2986-71. Test data from the supplier's quality control program are sufficient for this purpose.

3.1.2 Silica Gel. Indicating type, 6- to 16-mesh. If previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.3 Crushed Ice.

3.1.4 Stopcock Grease. Acetone-insoluble, heat-stable silicone grease. This is not necessary if screw-on connectors with Teflon sleeves, or similar, are used. Alternatively, other types of stopcock grease may be used, subject to the approval of the Administrator.

3.2 Sample Recovery. Acetone, reagent grade, 0.001 percent residue, in glass bottles. Acetone from metal containers generally has a high residue blank and should not be used. Sometimes, suppliers transfer acetone to glass bottles from metal containers. Thus, acetone blanks shall be run prior to field use and only acetone with low blank values (0.001 percent) shall be used. In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight.

3.3 Analysis.

3.3.1 Acetone. Same as 3.2.

3.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

4. *Procedure.*

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation. All components shall be maintained and calibrated ac-

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cording to the procedure described in APTD-0576, unless otherwise specified herein.

Weigh several 200 to 300 g portions of silica gel in air-tight containers to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel need not be preweighed, but may be weighed directly in its impinger or sampling holder just prior to train assembly.

Check filters visually against light for irregularities and flaws or pinhole leaks. Label filters of the proper size on the back side near the edge using numbering machine ink. As an alternative, label the shipping containers (glass or plastic petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

Desiccate the filters at 20±5.6° C (68±10° F) and ambient pressure for at least 24 hours and weigh at intervals of at least 6 hours to a constant weight, i.e., 0.5 mg change from previous weighing; record results to the nearest 0.1 mg. During each weighing the filter must not be exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50 percent. Alternatively (unless otherwise specified by the Administrator), the filters may be oven dried at 105° C (220° F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

4.1.2 Preliminary Determinations. Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Make a projected-area model of the probe extension-filter holder assembly, with the pitot tube face openings positioned along the centerline of the stack, as shown in Figure 17-2. Calculate the estimated cross-section blockage, as shown in Figure 17-2. If the blockage exceeds 5 percent of the duct cross sectional area, the tester has the following options: (1) a suitable out-of-stack filtration method may be used instead of in-stack filtration; or (2) a special in-stack arrangement, in which the sampling and velocity measurement sites are separate, may be used; for details concerning this approach, consult with the Administrator (see also Citation 10 in Section 7). Determine the stack pressure, temperature, and the range of velocity heads using Method 2; it is recommended that a leak-check of the pitot lines (see Method 2, Section 3.1) be performed. Determine the moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in Method 2, Section 3.6; if integrated Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the particular sample run.

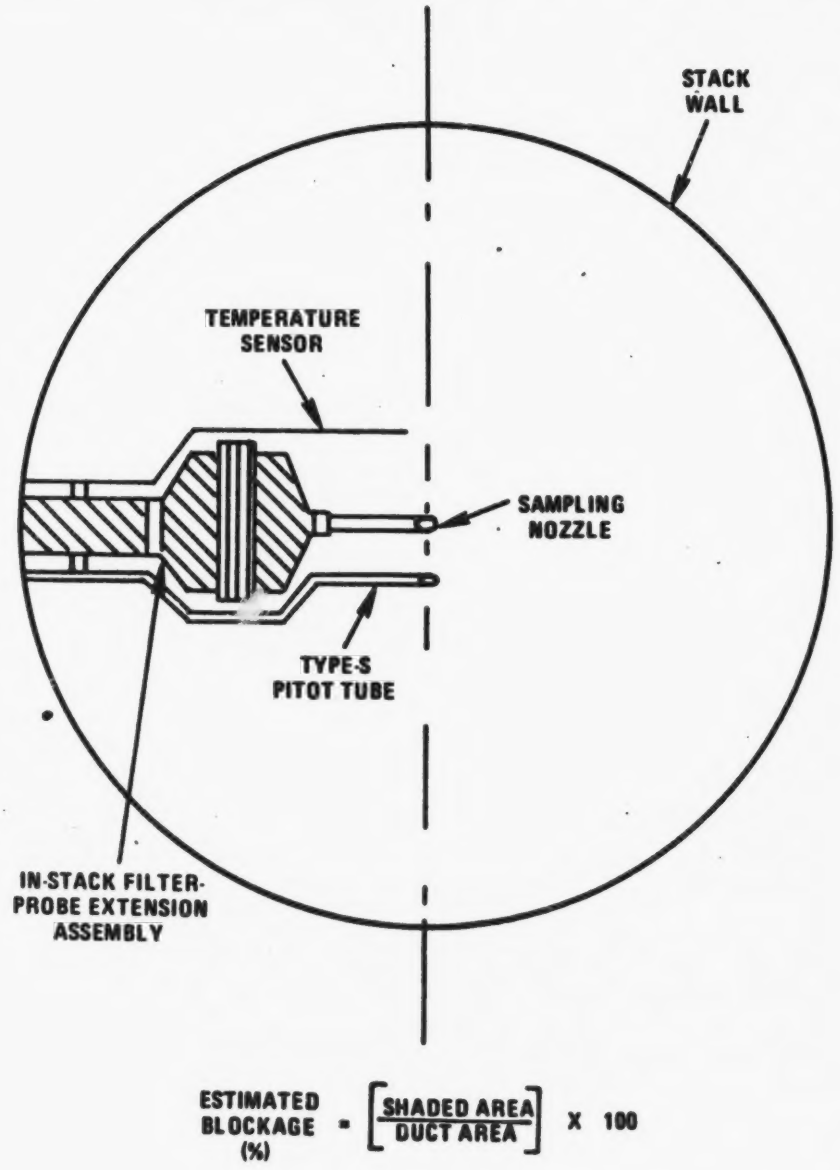
STACK WALL
TEMPERATURE SENSOR
SAMPLING NOZZLE
TYPE-S PITOT TUBE
IN-STACK FILTER-PROBE EXTENSION ASSEMBLY
ESTIMATED BLOCKAGE (%) = [SHADED AREA / DUCT AREA] X 100

Figure 17-2. Projected-area model of cross-section blockage (approximate average for a sample traverse) caused by an in-stack filter holder-probe extension assembly.

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Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of Method 2).

Select a probe extension length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the length of probes.

Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that (1) the sampling time per point is not less than 2 minutes (or some greater time interval if specified by the Administrator), and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

It is recommended that the number of minutes sampled at each point be an integer or an integer plus one-half minute, in order to avoid timekeeping errors.

In some circumstances, e.g., batch cycles, it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

4.1.3 Preparation of Collection Train. During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

If impingers are used to condense stack gas moisture, prepare them as follows: place 100 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

If some means other than impingers is used to condense moisture, prepare the condenser (and, if appropriate, silica gel for condenser outlet) for use.

Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as not to allow the sample gas stream to circumvent the filter. Check filter for tears after assembly is completed. Mark the probe extension with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Assemble the train as in Figure 17-1, using a very light coat of silicone grease on all ground glass joints and greasing only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease. Place crushed ice around the impingers.

4.1.4 Leak Check Procedures.

4.1.4.1 Pretest Leak-Check. A pretest leak-check is recommended, but not required. If the tester opts to conduct the pretest leak-check, the following procedure shall be used.

After the sampling train has been assembled, plug the inlet to the probe nozzle with a material that will be able to withstand the stack temperature. Insert the filter holder into the stack and wait approximately 5 minutes (or longer, if necessary) to allow the system to come to equilibrium with the temperature of the stack gas stream. Turn on the pump and draw a vacuum of at least 380 mm Hg (15 in. Hg); note that a lower vacuum may be used, provided that it is not exceeded during the test. Determine the leakage rate. A leakage rate in excess of 4 percent of the average sampling rate or 0.00057 m^3/min. (0.02 cfm), whichever is less, is unacceptable.

The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with by-pass valve fully open and coarse adjust valve completely closed. Partially open the coarse adjust valve and slowly close the by-pass valve until the desired vacuum is reached. Do not reverse direction of by-pass valve. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check as shown below and start over.

When the leak-check is completed, first slowly remove the plug from the inlet to the probe nozzle and immediately turn off the vacuum pump. This prevents water from being forced backward and keeps silica gel from being entrained backward.

4.1.4.2 Leak-Checks During Sample Run. If, during the sampling run, a component (e.g., filter assembly or impinger) change becomes necessary, a leak-check shall be conducted immediately before the change is made. The leak-check shall be done according to the procedure outlined in Section 4.1.4.1 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered;

if, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and plan to correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

Immediately after component changes, leak-checks are optional; if such leak-checks are done, the procedure outlined in Section 4.1.4.1 above shall be used.

4.1.4.3 Post-Test Leak-Check. A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done in accordance with the procedures outlined in Section 4.1.4.1, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

4.1.5 Particulate Train Operation. During the sampling run, maintain a sampling rate such that sampling is within 10 percent of true isokinetic, unless otherwise specified by the Administrator.

For each run, record the data required on the example data sheet shown in Figure 17-3. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted. Take other readings required by Figure 17-3 at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

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PLANT _____

LOCATION _____

OPERATOR _____

DATE _____

RUN NO. _____

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔHg _____

C FACTOR _____

PITOT TUBE COEFFICIENT, Cp _____

SCHEMATIC OF STACK CROSS SECTION

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE EXTENSION LENGTH, m(ft.) _____

NOZZLE IDENTIFICATION NO. _____

AVERAGE CALIBRATED NOZZLE DIAMETER cm(in.) _____

FILTER NO. _____

LEAK RATE, m^3/min,(cfm) _____

STATIC PRESSURE, mm Hg (in. Hg) _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	VACUUM mm Hg (in. Hg)	STACK TEMPERATURE (T_s), °C (°F)	VELOCITY HEAD (ΔP_s), mm H_2O (in. H_2O)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER, mm H_2O (in. H_2O)	GAS SAMPLE VOLUME, m^3 (ft^3)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER, °C (°F)
							INLET, °C (°F)	OUTLET, °C (°F)	
TOTAL							Avg	Avg	
AVERAGE							Avg		

Figure 17-3. Particulate field data.

Clean the portholes prior to the test run to minimize the chance of sampling the deposited material. To begin sampling, remove the nozzle cap and verify that the pitot tube and probe extension are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available, which aid in the rapid adjustment to the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient is 0.85±0.02, and the stack gas equivalent density (dry molecular weight) is equal to 29±4. APTD-0576 details the procedure for using the nomographs. If C_p and M_d are outside the above stated ranges, do not use the nomographs unless appropriate steps (see Citation 7 in Section 7) are taken to compensate for the deviations.

When the stack is under significant negative pressure (height of impinger stem), take care to close the coarse adjust valve before inserting the probe extension assembly into the stack to prevent water from being forced backward. If necessary, the pump may be turned on with the coarse adjust valve closed.

When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

Traverse the stack cross section, as required by Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe extension through the portholes, to minimize chance of extracting deposited material.

During the test run, take appropriate steps (e.g., adding crushed ice to the impinger ice bath) to maintain a temperature of less than 20° C (68° F) at the condenser outlet; this will prevent excessive moisture losses. Also, periodically check the level and zero of the manometer.

If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced in the midst of a sample run. It is recommended that another complete filter holder assembly be used rather than attempting to change the filter itself. Before a new filter holder is installed, conduct a leak check, as outlined in Section 4.1.4.2. The total particulate weight shall include the summation of all filter assembly catches.

A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or, in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator. Note that when two or more trains are used, a separate analysis of the collected particulate from each train shall be performed, unless identical nozzle sizes were used on all trains, in which case the particulate catches from the individual trains may be combined and a single analysis performed.

At the end of the sample run, turn off the pump, remove the probe extension assembly from the stack, and record the final dry gas meter reading. Perform a leak-check, as outlined in Section 4.1.4.3. Also, leak-check the pitot lines as described in Section 3.1 of Method 2; the lines must pass this leak-check, in order to validate the velocity head data.

4.1.6 Calculation of Percent Isokinetic. Calculate percent isokinetic (see Section 6.11) to determine whether another test run should be made. If there is difficulty in maintaining isokinetic rates due to source conditions, consult with the Administrator for possible variance on the isokinetic rates.

4.2 Sample Recovery. Proper cleanup procedure begins as soon as the probe extension assembly is removed from the stack at the end of the sampling period. Allow the assembly to cool.

When the assembly can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over it to prevent losing or gaining particulate matter. Do not cap off the probe tip tightly while the sampling train is cooling down as this would create a vacuum in the filter holder, forcing condenser water backward.

Before moving the sample train to the cleanup site, disconnect the filter holder-probe nozzle assembly from the probe extension; cap the open inlet of the probe extension. Be careful not to lose any condensate, if present. Remove the umbilical cord from the condenser outlet and cap the outlet. If a flexible line is used between the first impinger (or condenser) and the probe extension, disconnect the line at the probe extension and let any condensed water or liquid drain into the impingers or condenser. Disconnect the probe extension from the condenser; cap the probe extension outlet. After wiping off the silicone grease, cap off the condenser inlet. Ground glass stoppers, plastic caps, or serum caps (whichever are appropriate) may be used to close these openings.

Transfer both the filter holder-probe nozzle assembly and the condenser to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

Save a portion of the acetone used for cleanup as a blank. Take 200 ml of this ac-

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etone directly from the wash bottle being used and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Carefully transfer to the petri dish any particulate matter and/or filter fibers which adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe nozzle or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, fitting, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank and follow Administrator's directions on analysis. Perform the acetone rinses as follows:

Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse with acetone the inside parts of the fitting in a similar way until no visible particles remain. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Rinse the brush with acetone and quantitatively collect these washings in the sample container. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints are wiped clean of silicone grease (if applicable), clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make final rinse of the brush and filter holder. After all acetone washings and particulate matter are collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occurred during transport. Label the container to clearly identify its contents.

Container No. 3. If silica gel is used in the condenser system for mositure content determination, note the color of the gel to determine if it has been completely spent; make a notation of its condition. Transfer the silica gel back to its original container and seal. A funnel may make it easier to pour the silica gel without spilling, and a rubber policeman may be used as an aid in removing the silica gel. It is not necessary to remove the small amount of dust particles that may adhere to the walls and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 under "Analysis."

Condenser Water. Treat the condenser or impinger water as follows: make a notation of any color or film in the liquid catch. Measure the liquid volume to within ± 1 ml by using a graduated cylinder or, if a balance is available, determine the liquid weight to within ± 0.5 g. Record the total volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas. Discard the liquid after measuring and recording the volume or weight.

4.3 Analysis. Record the data required on the example sheet shown in Figure 17-4. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose particulate from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at the average stack temperature or 105° C (220° F), whichever is less, for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at the average stack temperature or 105° C (220° F), whichever is less, for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Plant _____

Date _____

Run No. _____

Filter No. _____

Amount liquid lost during transport _____

Acetone blank volume, ml _____

Acetone wash volume, ml _____

Acetone black concentration, mg/mg (equation 17-4) _____

Acetone wash blank, mg (equation 17-5) _____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
TOTAL			
		Less acetone blank	
		Weight of particulate matter	

	VOLUME OF LIQUID WATER COLLECTED		
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g	
FINAL			
INITIAL			
LIQUID COLLECTED			
TOTAL VOLUME COLLECTED		g*	ml

* CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING TOTAL WEIGHT INCREASE BY DENSITY OF WATER (1g/ml).

$$\frac{\text{INCREASE, g}}{\text{1 g/ml}} = \text{VOLUME WATER, ml}$$

Figure 17-4. Analytical data.

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Container No. 2. Note the level of liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. This step may be conducted in the field. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance.

"Acetone Blank" Container. Measure acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

5. *Calibration.* Maintain a laboratory log of all calibrations.

5.1 Probe Nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

5.2 Pitot Tube. If the pitot tube is placed in an interference-free arrangement with respect to the other probe assembly components, its baseline (isolated tube) coefficient shall be determined as outlined in Section 4 of Method 2. If the probe assembly is not interference-free, the pitot tube assembly coefficient shall be determined by calibration, using methods subject to the approval of the Administrator.

5.3 Metering System. Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry gas meter dial readings to correspond to the wet test meter readings, calibration factors may be used to mathematically correct the gas meter dial readings to the proper values.

Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: make a 10-minute calibration run at 0.00057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet test meter and dry gas meter volumes; divide the difference by 10, to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test), with the vacuum set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

Alternative procedures, e.g., using the orifice meter coefficients, may be used, subject to the approval of the Administrator.

NOTE: If the dry gas meter coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

5.4 Temperature Gauges. Use the procedure in Section 4.3 of Method 2 to calibrate in-stack temperature gauges. Dial thermometers, such as are used for the dry gas meter and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

5.5 Leak Check of Metering System Shown in Figure 17-1. That portion of the sampling train from the pump to the orifice meter should be leak checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 17-5). Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice ex-

haust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 18 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for one minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

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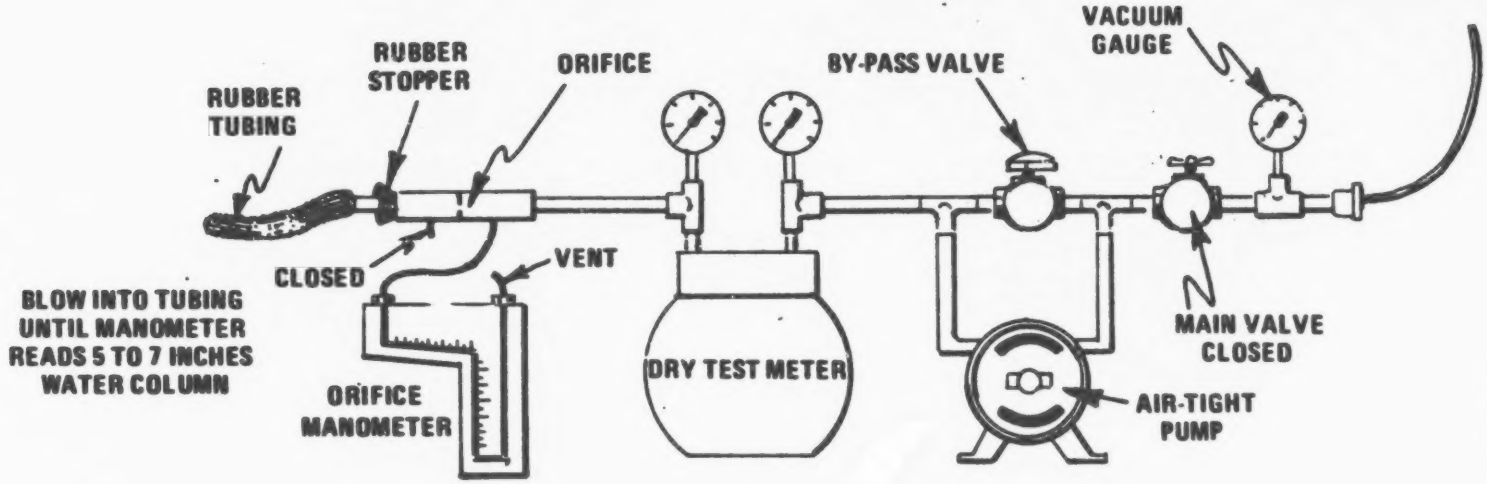

Figure 17-5. Leak check of meter box.

5.6 Barometer. Calibrate against a mercury barometer.

6. *Calculations.* Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

6.1 Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream, proportion by volume.
C_a = Acetone blank residue concentration, mg/g.
c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
I = Percent of isokinetic sampling.
L_a = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (i = 1, 2, 3 . . . n), m^3/min (cfm).
L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).
m_n = Total amount of particulate matter collected, mg.
M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).
m_a = Mass of residue of acetone after evaporation, mg.
P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
R = Ideal gas constant, 0.06236 mm Hg-m^3/°K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).
T_m = Absolute average dry gas meter temperature (see Figure 17-3), °K (°R).
T_s = Absolute average stack gas temperature (see Figure 17-3), °K (°R).
T_{std} = Standard absolute temperature, 293°K (528°R).
V_a = Volume of acetone blank, ml.
V_{aw} = Volume of acetone used in wash, ml.
V_{lc} = Total volume of liquid collected in impingers and silica gel (see Figure 17-4), ml.
V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).
$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
v_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 17, m/sec (ft/sec).
W_a = Weight of residue in acetone wash, mg.
Y = Dry gas meter calibration coefficient.
ΔH = Average pressure differential across the orifice meter (see Figure 17-3), mm H_2O (in. H_2O).
ρ_a = Density of acetone, mg/ml (see label on bottle).
ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).
θ = Total sampling time, min.
θ_1 = Sampling time interval, from the beginning of a run until the first component change, min.
θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.
θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.
13.6 = Specific gravity of mercury.
60 = Sec/min.
100 = Conversion to percent.

6.2 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 17-3).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C, 760 mm Hg or 68° F, 29.92 in. Hg) by using Equation 17-1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right]$$

$$= K_1 V_m Y \frac{P_{bar} + (\Delta H/13.6)}{T_m}$$

Equation 17-1

where:

K_1 = 0.3858° K/mm Hg for metric units; 17.64° R/in. Hg for English units.

NOTE: Equation 17-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 17-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 17-1 with the expression:

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$$[V_m-(L_p-L_a)\theta]$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 17-1 by the expression:

$$\left[V_m - (L_1 - L_a)\,\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\,\theta_i - (L_p - L_a)\,\theta_p\right]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_a.

6.4 Volume of water vapor.

$$V_{w(std)} = V_{lc}\left(\frac{\rho_w}{M_w}\right)\left(\frac{RT_{std}}{P_{std}}\right) = K_2\,V_{lc}$$

Equation 17-2

where:

K_2=0.001333 m³/ml for metric units; 0.04707 ft³/ml for English units.

6.5 Moisture Content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)}+V_{w(std)}}$$

Equation 17-3

6.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a\rho_a}$$

Equation 17-4

6.7 Acetone Wash Blank.

$$W_a = C_a V_{aw}\rho_a$$

Equation 17-5

6.8 Total Particulate Weight. Determine the total particulate catch from the sum of the weights obtained from containers 1 and 2 less the acetone blank (see Figure 17-4).

NOTE: Refer to Section 4.1.5 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

6.9 Particulate Concentration.

$$c_s = (0.001\ g/mg)\,(m_a/V_{m(std)})$$

Equation 17-6

6.10 Conversion Factors:

From	To	Multiply by
scf	m^3	0.02832
g/ft^3	gr/ft^3	15.43
g/ft^3	lb/ft^3	2.205×10^{-3}
g/ft^3	g/m^3	35.31

6.11 Isokinetic Variation.

6.11.1 Calculation from Raw Data.

$$I = \frac{100\,T_s\,[K_3 V_{lc} + (V_m Y/T_m)\,(P_{bar} + \Delta H/13.6)]}{60\,\theta v_s\,P_s\,A_n}$$

Equation 17-7

where:

K_3=0.003454 mm Hg-m³/ml-°K for metric units; 0.002669 in. Hg-ft³/ml-°R for English units.

6.11.2 Calculation from Intermediate Values.

$$I = \frac{T_s\,V_{m(std)}\,P_{std}\,100}{T_{std}\,v_s\,\theta\,A_n\,P_s\,60\,(1-B_{ws})} = K_4\,\frac{T_s\,V_{m(std)}}{P_s\,v_s\,A_n\,\theta\,(1-B_{ws})}$$

Equation 17-8

where:

K_4=4.320 for metric units; 0.09450 for English units.

6.12 Acceptable Results. If 90 percent <I <110 percent, the results are acceptable. If the results are low in comparison to the standard and I is beyond the acceptable range, or, if I is less than 90 percent, the Ad-

ministrator may opt to accept the results. Use Citation 4 in Section 7 to make judgments. Otherwise, reject the results and repeat the test.

7. *Bibliography.*

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Method 18—[Reserved]

Method 19—Determination of Sulfur Dioxide Removal Efficiency and Particulate, Sulfur Dioxide and Nitrogen Oxides Emission Rates From Electric Utility Steam Generators

1. Principle and applicability

1.1 *Principle.*

1.1.1 Fuel samples from before and after fuel pretreatment systems are collected and analyzed for sulfur and heat content, and the percent sulfur dioxide (ng/Joule, lb/million Btu) reduction is calculated on a dry basis. (Optional Procedure.)

1.1.2 Sulfur dioxide and oxygen or carbon dioxide concentration data obtained from sampling emissions upstream and downstream of sulfur dioxide control devices are used to calculate sulfur dioxide removal efficiencies. (Minimum Requirement.) As an alternative to sulfur dioxide monitoring upstream of sulfur dioxide control devices, fuel samples may be collected in an as-fired condition and analyzed for sulfur and heat content. (Optional Procedure.)

1.1.3 An overall sulfur dioxide emission reduction efficiency is calculated from the efficiency of fuel pretreatment systems and the efficiency of sulfur dioxide control devices.

1.1.4 Particulate, sulfur dioxide, nitrogen oxides, and oxygen or carbon dioxide concentration data obtained from sampling emissions downstream from sulfur dioxide control devices are used along with F factors to calculate particulate, sulfur dioxide, and nitrogen oxides emission rates. F factors are values relating combustion gas volume to the heat content of fuels.

1.2 *Applicability.* This method is applicable for determining sulfur removal efficiencies of fuel pretreatment and sulfur dioxide control devices and the overall reduction of potential sulfur dioxide emissions from electric utility steam generators. This method is also applicable for the determination of particulate, sulfur dioxide, and nitrogen oxides emission rates.

2. Determination of Sulfur Dioxide Removal Efficiency of Fuel Pretreatment Systems

2.1 *Solid Fossil Fuel.*

2.1.1 *Sample Increment Collection.* Use ASTM D 2234[1], Type I, conditions A, B, or C, and systematic spacing. Determine the number and weight of increments required per gross sample representing each coal lot according to Table 2 or Paragraph 7.1.5.2 of ASTM D 2234[1]. Collect one gross sample for each raw coal lot and one gross sample for each product coal lot.

2.1.2 *ASTM Lot Size.* For the purpose of Section 2.1.1, the product coal lot size is defined as the weight of product coal produced from one type of raw coal. The raw coal lot size is the weight of raw coal used to produce one product coal lot. Typically, the lot size is the weight of coal processsed in a 1-day (24 hours) period. If more than one type of coal is treated and produced in 1 day, then gross samples must be collected and analyzed for each type of coal. A coal lot size equaling the 90-day quarterly fuel

[1] Use the most recent revision or designation of the ASTM procedure specified.

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quantity for a specific power plant may be used if representative sampling can be conducted for the raw coal and product coal.

NOTE: Alternate definitions of fuel lot sizes may be specified subject to prior approval of the Administrator.

2.1.3 *Gross Sample Analysis.* Determine the percent sulfur content (%S) and gross calorific value (GCV) of the solid fuel on a dry basis for each gross sample. Use ASTM 2013 [1] for sample preparation, ASTM D 3177 [1] for sulfur analysis, and ASTM D 3173 [1] for moisture analysis. Use ASTM D 3176 [1] for gross calorific value determination.

2.2 *Liquid Fossil Fuel.*

2.2.1 *Sample Collection.* Use ASTM D 270 [1] following the practices outlined for continuous sampling for each gross sample representing each fuel lot.

2.2.2 *Lot Size.* For the purposes of Section 2.2.1, the weight of product fuel from one pretreatment facility and intended as one shipment (ship load, barge load, etc.) is defined as one product fuel lot. The weight of each crude liquid fuel type used to produce one product fuel lot is defined as one inlet fuel lot.

NOTE: Alternate definitions of fuel lot sizes may be specified subject to prior approval of the Administrator.

NOTE: For the purposes of this method, raw or inlet fuel (coal or oil) is defined as the fuel delivered to the desulfurization pretreatment facility or to the steam generating plant. For pretreated oil the input oil to the oil desulfurization process (e.g. hydrotreatment emitted) is sampled.

2.2.3 *Sample Analysis.* Determine the percent sulfur content (%S) and gross calorific value (GCV). Use ASTMD 240 [1] for the sample analysis. This value can be assumed to be on a dry basis.

2.3 *Calculation of Sulfur Dioxide Removal Efficiency Due to Fuel Pretreatment.* Calculate the percent sulfur dioxide reduction due to fuel pretreatment using the following equation:

$$\%R_f = 100\left[1 - \frac{\%S_o/GCV_o}{\%S_i/GCV_i}\right]$$

Where:

$\%R_f$ = Sulfur dioxide removal efficiency due pretreatment; percent.

$\%S_o$ = Sulfur content of the product fuel lot on a dry basis; weight percent.

$\%S_i$ = Sulfur content of the inlet fuel lot on a dry basis; weight percent.

GCV_o = Gross calorific value for the outlet fuel lot on a dry basis; kJ/kg (Btu/lb).

GCV_i = Gross calorific value for the inlet fuel lot on a dry basis; kJ/kg (Btu/lb).

NOTE: If more than one fuel type is used to produce the product fuel, use the following equation to calculate the sulfur contents per unit of heat content of the total fuel lot, %S/GCV:

$$\%S/GCV = \sum_{k=1}^{n} Y_k(\%S_k/GCV_k)$$

Where:

Y_k = The fraction of total mass input derived from each type, k, of fuel.

$\%S_k$ = Sulfur content of each fuel type, k, on a dry basis; weight percent.

GCV_k = Gross calorific value for each fuel type, k, on a dry basis; kJ/kg (Btu/lb).

n = The number of different types of fuels.

3. Determination of Sulfur Removal Efficiency of the Sulfur Dioxide Control Device

3.1 *Sampling.* Determine SO_2 emission rates at the inlet and outlet of the sulfur dioxide control system according to methods specified in the applicable subpart of the regulations and the procedures specified in Section 5. The inlet sulfur dioxide emission rate may be determined through fuel analysis (Optional, see Section 3.3.)

3.2. *Calculation.* Calculate the percent removal efficiency using the following equation:

$$\%R_{g(m)} = 100 \times \left(1.0 - \frac{E_{SO_2o}}{E_{SO_2i}}\right)$$

Where:

$\%R_g$ = Sulfur dioxide removal efficiency of the sulfur dioxide control system using inlet and outlet monitoring data; percent.

E_{SO_2o} = Sulfur dioxide emission rate from the outlet of the sulfur dioxide control system; ng/J (lb/million Btu).

[1] Use the most recent revision or designation of the ASTM procedure specified.

E_{SO_2} = Sulfur dioxide emission rate to the outlet of the sulfur dioxide control system; ng/J (lb/million Btu).

3.3 *As-fired Fuel Analysis (Optional Procedure).* If the owner or operator of an electric utility steam generator chooses to determine the sulfur dioxide imput rate at the inlet to the sulfur dioxide control device through an as-fired fuel analysis in lieu of data from a sulfur dioxide control system inlet gas monitor, fuel samples must be collected in accordance with applicable paragraph in Section 2. The sampling can be conducted upstream of any fuel processing, e.g., plant coal pulverization. For the purposes of this section, a fuel lot size is defined as the weight of fuel consumed in 1 day (24 hours) and is directly related to the exhaust gas monitoring data at the outlet of the sulfur dioxide control system.

3.3.1 *Fuel Analysis.* Fuel samples must be analyzed for sulfur content and gross calorific value. The ASTM procedures for determining sulfur content are defined in the applicable paragraphs of Section 2.

3.3.2 *Calculation of Sulfur Dioxide Input Rate.* The sulfur dioxide imput rate determined from fuel analysis is calculated by:

$$I_s = \frac{2.0(\%S_f)}{GCV} \times 10^7 \quad \text{for S. I. units.}$$

$$I_s = \frac{2.0(\%S_f)}{GCV} \times 10^4 \quad \text{for English units.}$$

Where:

I_s = Sulfur dioxide input rate from as-fired fuel analysis, ng/J (lb/million Btu).

$\%S_f$ = Sulfur content of as-fired fuel, on a dry basis; weight percent.

GCV = Gross calorific value for as-fired fuel, on a dry basis; kJ/kg (Btu/lb).

3.3.3 *Calculation of Sulfur Dioxide Emission Reduction Using As-fired Fuel Analysis.* The sulfur dioxide emission reduction efficiency is calculated using the sulfur imput rate from paragraph 3.3.2 and the sulfur dioxide emission rate, E_{SO_2}, determined in the applicable paragraph of Section 5.3. The equation for sulfur dioxide emission reduction efficiency is:

$$\%R_{g(f)} = 100 \times \left(1.0 - \frac{E_{SO_2}}{I_s}\right)$$

Where:

$\%R_{g(f)}$ = Sulfur dioxide removal efficiency of the sulfur dioxide control system using as-fired fuel analysis data; percent.

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E_{SO_2} = Sulfur dioxide emission rate from sulfur dioxide control system; ng/J (lb/million Btu).

I_s = Sulfur dioxide input rate from as-fired fuel analysis; ng/J (lb/million Btu).

4. Calculation of Overall Reduction in Potential Sulfur Dioxide Emission

4.1 The overall percent sulfur dioxide reduction calculation uses the sulfur dioxide concentration at the inlet to the sulfur dioxide control device as the base value. Any sulfur reduction realized through fuel cleaning is introduced into the equation as an average percent reduction, $\%R_f$.

4.2 Calculate the overall percent sulfur reduction as:

$$\%R_o = 100\left[1.0 - \left(1.0 - \frac{\%R_f}{100}\right)\left(1.0 - \frac{\%R_g}{100}\right)\right]$$

Where:

$\%R_o$ = Overall sulfur dioxide reduction; percent.

$\%R_f$ = Sulfur dioxide removal efficiency of fuel pretreatment from Section 2; percent. Refer to applicable subpart for definition of applicable averaging period.

$\%R_g$ = Sulfur dioxide removal efficiency of sulfur dioxide control device either O_2 or CO_2 - based calculation or calculated from fuel analysis and emission data, from Section 3; percent. Refer to applicable subpart for definition of applicable averaging period.

5. Calculation of Particulate, Sulfur Dioxide, and Nitrogen Oxides Emission Rates

5.1 *Sampling.* Use the outlet SO_2 or O_2 or CO_2 concentrations data obtained in Section 3.1. Determine the particulate, NO_x, and O_2 or CO_2 concentrations according to methods specified in an applicable subpart of the regulations.

5.2 *Determination of an F Factor.* Select an average F factor (Section 5.2.1) or calculate an applicable F factor (Section 5.2.2.). If combined fuels are fired, the selected or calculated F factors are prorated using the procedures in Section 5.2.3. F factors are ratios of the gas volume released during combustion of a fuel divided by the heat content of the fuel. A dry F factor (F_d) is the ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted; a wet F factor (F_w) is the ratio of the volume of wet flue gases generated to the calorific value of the fuel combusted; and the carbon F factor (F_c) is the ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted. When pollutant and oxygen concentrations have been determined in Section 5.1, wet or dry F factors are used. (F_w) factors and associated emission calculation procedures are not applicable and may not be used after wet scrubbers; (F_c) or (F_d) factors and associated emission calculation procedures are used after wet scrubbers.) When pollutant and carbon dioxide concentrations have been determined in Section 5.1, F_c factors are used.

5.2.1 *Average F Factors.* Table 1 shows average F_d, F_w, and F_c factors (scm/J, scf/million Btu) determined for commonly used fuels. For fuels not listed in Table 1, the F factors are calculated according to the procedures outlined in Section 5.2.2 of this section.

5.2.2 *Calculating an F Factor.* If the fuel burned is not listed in Table 1 or if the owner or operator chooses to determine an F factor rather than use the tabulated data, F factors are calculated using the equations below. The sampling and analysis procedures followed in obtaining data for these calculations are subject to the approval of the Administrator and the Administrator should be consulted prior to data collection.

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For SI Units:

$$F_d = \frac{227.0(\%H) + 95.7(\%C) + 35.4(\%S) + 8.6(\%N) - 28.5(\%O)}{GCV}$$

$$F_w = \frac{347.4(\%H)+95.7(\%C)+35.4(\%S)+8.6(\%N)-28.5(\%O)+13.0(\%H_2O)^{**}}{GCV_w}$$

$$F_c = \frac{20.0(\%C)}{GCV}$$

For English Units:

$$F_d = \frac{10^6[5.57(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O)]}{GCV}$$

$$F_w = \frac{10^6[5.57(\%H)+1.53(\%C)+0.57(\%S)+0.14(\%N)-0.46(\%O)+0.21(\%H_2O)^{**}]}{GCV_w}$$

$$F_c = \frac{10^6[0.321(\%C)]}{GCV}$$

** The $\%H_2O$ term may be omitted if %H and %O include the unavailable hydrogen and oxygen in the form of H_2O.

Where:

F_d, F_w, and F_c have the units of scm/J, or scf/million Btu; %H, %C, %S, %N, %O, and $\%H_2O$ are the concentrations by weight (expressed in percent) of hydrogen, carbon, sulfur, nitrogen, oxygen, and water from an ultimate analysis of the fuel; and GCV is the gross calorific value of the fuel in kJ/kg or Btu/lb and consistent with the ultimate analysis. Follow ASTM D 2015* for solid fuels, D 240* for liquid fuels, and D 1826* for gaseous fuels as applicable in determining GCV.

5.2.3 *Combined Fuel Firing F Factor.* For affected facilities firing combinations of fossil fuels or fossil fuels and wood residue, the F_d, F_w, or F_c factors determined by Sections 5.2.1 or 5.2.2 of this section shall be prorated in accordance with applicable formula as follows:

$$F_d = \sum_{k=1}^{n} x_k F_{dk} \quad \text{or}$$

$$F_w = \sum_{k=1}^{n} x_k F_{wk} \quad \text{or}$$

$$F_c = \sum_{k=1}^{n} x_k F_{ck}$$

Where:

x_k = The fraction of total heat input derived from each type of fuel, K.

n = The number of fuels being burned in combination.

5.3 *Calculation of Emission Rate.* Select from the following paragraphs the applica-

ble calculation procedure and calculate the particulate, SO_2, and NO_x emission rate. The values in the equations are defined as:

E=Pollutant emission rate, ng/J (lb/million Btu).

C=Pollutant concentration, ng/scm (lb/scf).

NOTE: It is necessary in some cases to convert measured concentration units to other units for these calculations.

Use the following table for such conversions:

CONVERSION FACTORS FOR CONCENTRATION

From—	To—	Multiply by—
g/scm	ng/scm	10^9.
mg/scm	ng/scm	10^6.
lb/scf	ng/scm	1.602×10^{13}.
ppm(SO_2)	ng/scm	2.660×10^6.
ppm(NO_2)	ng/scm	1.912×10^6.
ppm/(SO_2)	lb/scf	1.660×10^{-7}.
ppm/(NO_2)	lb/scf	1.194×10^{-7}.

5.3.1 *Oxygen-Based F Factor Procedure.*

5.3.1.1 *Dry Basis.* When both percent oxygen ($\%O_{2d}$) and the pollutant concentration (C_d) are measured in the flue gas on a dry basis, the following equation is applicable:

$$E = C_d F_d \left[\frac{20.9}{20.9 - \%O_{2d}}\right]$$

5.3.1.2 *Wet Basis.* When both the percent oxygen ($\%O_{2w}$) and the pollutant concentration (C_w) are measured in the flue gas on a wet basis, the following equations are applicable:

NOTE: F_w factors are not applicable after wet scrubbers.

(a) $$E = C_w F_w \left[\frac{20.9}{20.9(1 - B_{wa}) - \%O_{2w}}\right]$$

Where:

B_{wa}=Proportion by volume of water vapor in the ambient air.

In lieu of actual measurement, B_{wa} may be estimated as follows:

NOTE: The following estimating factors are selected to assure that any negative error introduced in the term:

$$\left(\frac{20.9}{20.9(1 - B_{wa}) - \%O_{2ws}}\right)$$

will not be larger than −1.5 percent. However, positive errors, or over-estimation of emissions, of as much as 5 percent may be introduced depending upon the geographic location of the facility and the associated range of ambient moisture.

(i) B_{wa}=0.027. This factor may be used as a constant value at any location.

(ii) B_{wa}=Highest monthly average of B_{ws} which occurred within a calendar year at the nearest Weather Service Station.

(iii) B_{wa}=Highest daily average of B_{ws} which occurred within a calendar month at the nearest Weather Service Station, calculated from the data for the past 3 years. This factor shall be calculated for each month and may be used as an estimating factor for the respective calendar month.

(b) $$E = C_w F_d \left[\frac{20.9}{20.9 (1 - B_{ws}) - \%O_{2w}}\right]$$

Where:

B_{ws}=Proportion by volume of water vapor in the stack gas.

5.3.1.3 *Dry/Wet Basis.* When the pollutant concentration (C_w) is measured on a wet basis and the oxygen concentration ($\%O_{2d}$) or measured on a dry basis, the following equation is applicable:

$$E = \left[\frac{C_w F_d}{(1 - B_{ws})}\right] \left[\frac{20.9}{20.9 - \%O_{2d}}\right]$$

When the pollutant concentration (C_d) is measured on a dry basis and the oxygen concentration ($\%O_{2d}$) is measured on a wet basis, the following equation is applicable:

$$E = C_d F_d \frac{20.9}{20.9 - \frac{\%O_{2w}}{(1 - B_{ws})}}$$

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5.3.2 *Carbon Dioxide-Based F Factor Procedure.*

5.3.2.1 *Dry Basis.* When both the percent carbon dioxide ($\%CO_{2d}$) and the pollutant concentration (C_d) are measured in the flue gas on a dry basis, the following equation is applicable:

$$E = C_d F_c \left(\frac{100}{\%CO_{2d}}\right)$$

5.3.2.2 *Wet Basis.* When both the percent carbon dioxide ($\%CO_{2w}$) and the pollutant concentration (C_w) are measured on a wet basis, the following equation is applicable:

$$E = C_w F_c \left(\frac{100}{\%CO_{2w}}\right)$$

5.3.2.3 *Dry/Wet Basis.* When the pollutant concentration (C_w) is measured on a wet basis and the percent carbon dioxide ($\%CO_{2d}$) is measured on a dry basis, the following equation is applicable:

$$E = \left[\frac{C_w F_c}{(1 - B_{ws})}\right] \left[\frac{100}{\%CO_{2d}}\right]$$

When the pollutant concentration (C_d) is measured on a dry basis and the precent carbon dioxide ($\%CO_{2w}$) is measured on a wet basis, the following equation is applicable:

$$E = C_d (1 - B_{ws}) F_c \left(\frac{100}{\%CO_{2w}}\right)$$

5.4 *Calculation of Emission Rate from Combined Cycle-Gas Turbine Systems.* For gas turbine-steam generator combined cycle systems, the emissions from supplemental fuel fired to the steam generator or the percentage reduction in potential (SO_2) emissions cannot be determined directly. Using measurements from the gas turbine exhaust (performance test, subpart GG) and the combined exhaust gases from the steam generator, calculate the emission rates for these two points following the appropriate paragraphs in Section 5.3.

NOTE: F_w factors shall not be used to determine emission rates from gas turbines because of the injection of steam nor to calculate emission rates after wet scrubbers; F_d or F_c factor and associated calculation procedures are used to combine effluent emissions according to the procedure in Paragraph 5.2.3.

The emission rate from the steam generator is calculated as:

$$E_{ss} = \frac{E_c - X_{gt} E_{gt}}{X_{ss}}$$

Where:

E_{ss} = Pollutant emission rate from steam generator effluent, ng/J (lb/million Btu).

E_c = Pollutant emission rate in combined cycle effluent; ng/J (lb/million Btu).

E_{gt} = Pollutant emission rate from gas turbine effluent; ng/J (lb/million Btu).

X_{ss} = Fraction of total heat input from supplemental fuel fired to the steam generator.

X_{gt} = Fraction of total heat input from gas turbine exhaust gases.

NOTE: The total heat input to the steam generator is the sum of the heat input from supplemental fuel fired to the steam generator and the heat input to the steam generator from the exhaust gases from the gas turbine.

5.5 *Effect of Wet Scrubber Exhaust, Direct-Fired Reheat Fuel Burning.* Some wet scrubber systems require that the temperature of the exhaust gas be raised above the moisture dew-point prior to the gas entering the stack. One method used to accomplish this is directfiring of an auxiliary burner into the exhaust gas. The heat required for such burners is from 1 to 2 percent of total heat input of the steam generating plant. The effect of this fuel burning on the exhaust gas components will be less than ±1.0 percent and will have a similar effect on emission rate calculations. Because of this small effect, a determination of effluent gas constituents from direct-fired reheat burners for correction of stack gas concentrations is not necessary.

TABLE 19–1—F FACTORS FOR VARIOUS FUELS [1]

Fuel type	F_d		F_w		F_c	
	dscm J	dscf 10^6 Btu	wscm J	wscf J 10^6 Btu	scm J	scf 10^6 Btu
Coal:						
Anthracite [2]	2.71×10^{-7}	(10100)	2.83×10^{-7}	(10540)	0.530×10^{-7}	(1970)
Bituminous [2]	2.63×10^{-7}	(9780)	2.86×10^{-7}	(10640)	0.484×10^{-7}	(1800)
Lignite	2.65×10^{-7}	(9860)	3.21×10^{-7}	(11950)	0.513×10^{-7}	(1910)
Oil [3]	2.47×10^{-7}	(9190)	2.77×10^{-7}	(10320)	0.383×10^{-7}	(1420)
Gas:						
Natural	2.43×10^{-7}	(8710)	2.85×10^{-7}	(10610)	0.287×10^{-7}	(1040)
Propane	2.34×10^{-7}	(8710)	2.74×10^{-7}	(10200)	0.321×10^{-7}	(1190)
Butane	2.34×10^{-7}	(8710)	2.79×10^{-7}	(10390)	0.337×10^{-7}	(1250)
Wood	2.48×10^{-7}	(9240)			0.492×10^{-7}	(1830)
Wood Bark	2.58×10^{-7}	(9600)			0.497×10^{-7}	(1850)

[1] Determined at standard conditions: 20° C (68° F) and 760 mm Hg (29.92 in. Hg).
[2] As classified according to ASTM D 388–66.
[3] Crude, residual, or distillate.

6. Calculation of Confidence Limits for Inlet and Outlet Monitoring Data

6.1 *Mean Emission Rates.* Calculate the mean emission rates using hourly averages in ng/J (lb/million Btu) for SO_2 and NO_x outlet data and, if applicable, SO_2 inlet data using the following equations:

$$E_o = \frac{\Sigma x_o}{n_o}$$

$$E_i = \frac{\Sigma x_i}{n_i}$$

Where:

E_o = Mean outlet emission rate; ng/J (lb/million Btu).

E_i = Mean inlet emission rate; ng/J (lb/million Btu).

x_o = Hourly average outlet emission rate; ng/J (lb/million Btu).

x_i = Hourly average in let emission rate; ng/j (lb/million Btu).

n_o = Number of outlet hourly averages available for the reporting period.

n_i = Number of inlet hourly averages available for reporting period.

6.2 *Standard Deviation of Hourly Emission Rates.* Calculate the standard deviation of the available outlet hourly average emission rates for SO_2 and NO_x and, if applicable, the available inlet hourly average emission rates for SO_2 using the following equations:

$$s_o = \left(\frac{1}{n_o} - \frac{1}{720}\right)\left(\frac{\Sigma (E_o - x_o)^2}{n_o - 1}\right)$$

$$s_i = \left(\frac{1}{n_i} - \frac{1}{720}\right)\left(\frac{\Sigma (E_i - x_i)^2}{n_i - 1}\right)$$

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Where:

s_o = Standard deviation of the average outlet hourly average emission rates for the reporting period; ng/J (lb/million Btu).

s_i = Standard deviation of the average inlet hourly average emission rates for the reporting period; ng/J (lb/million Btu).

6.3 *Confidence Limits.* Calculate the lower confidence limit for the mean outlet emission rates for SO_2 and NO_x and, if applicable, the upper confidence limit for the mean inlet emission rate for SO_2 using the following equations:

$$E_o^* = E_o - t_{.\infty} s_o$$

$$E_i^* = E_i + t_{.\infty} s_i$$

Where:

E_o^* = The lower confidence limit for the mean outlet emission rates; ng/J (lb/million Btu).

E_i^* = The upper confidence limit for the mean inlet emission rate; ng/J (lb/million Btu).

$t_{.\infty}$ = Values shown below for the indicated number of available data points (n):

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VALUES FOR $t_{0.95}$

n	$t_{0.95}$
2	6.31
3	2.42
4	2.35
5	2.13
6	2.02
7	1.94
8	1.89
9	1.86
10	1.83
11	1.81
12-16	1.77
17-21	1.73
22-26	1.71
27-31	1.70
32-51	1.68
52-91	1.67
92-151	1.66
152 or more	1.65

The values of this table are corrected for n-1 degrees of freedom. Use n equal to the number of hourly average data points.

7. Calculation to Demonstrate Compliance When Available Monitoring Data Are Less Than the Required Minimum

7.1 *Determine Potential Combustion Concentration (PCC) for SO_2.*

7.1.1 When the removal efficiency due to fuel pretreatment (% R_f) is included in the overall reduction in potential sulfur dioxide emissions (% R_o) and the "as-fired" fuel analysis is not used, the potential combustion concentration (PCC) is determined as follows:

$$PCC = E_i^* + 2\left(\frac{\%\ S_i}{GCV_i} - \frac{\%\ S_o}{GCV_o}\right) 10^7;\ ng/J$$

$$PCC = E_i^* + 2\left(\frac{\%\ S_i}{GCV_i} - \frac{\%\ S_o}{GCV_o}\right) 10^4;\ lb/million\ Btu.$$

Where:

$\left(\frac{\%\ S_i}{GCV_i} - \frac{\%\ S_o}{GCV_o}\right)$ = Potential emissions removed by the pretreatment process, using the fuel parameters defined in section 2.3; ng/J (lb/million Btu).

7.1.2 When the "as-fired" fuel analysis is used and the removal efficiency due to fuel pretreatment (% R_f) is not included in the overall reduction in potential sulfur dioxide emissions (% R_o), the potential combustion concentration (PCC) is determined as follows:

$PCC = I_s$

Where:

I_s = The sulfur dioxide input rate as defined in section 3.3

7.1.3 When the "as-fired" fuel analysis is used and the removal efficiency due to fuel pretreatment (% R_f) is included in the overall reduction (% R_o), the potential combustion concentration (PCC) is determined as follows:

$$PCC = I_s + 2\left(\frac{\%\ S_i}{GCV_i} - \frac{\%\ S_o}{GCV_o}\right)10^7;\ ng/J$$

$$PCC = I_s + 2\left(\frac{\%\ S_i}{GCV_i} - \frac{\%\ S_o}{GCV_o}\right)10^4;\ lb/million\ Btu.$$

7.1.4 When inlet monitoring data are used and the removal efficiency due to fuel pretreatment (% R_f) is not included in the overall reduction in potential sulfur dioxide emissions (% R_o), the potential combustion concentration (PCC) is determined as follows:

$PCC = E_i^*$

Where:

E_i^* = The upper confidence limit of the mean inlet emission rate, as determined in section 6.3.

7.2 *Determine Allowable Emission Rates (E_{std}).*

7.2.1 *NO_x.* Use the allowable emission rates for NO_x as directly defined by the applicable standard in terms of ng/J (lb/million Btu).

7.2.2 *SO_2.* Use the potential combustion concentration (PCC) for SO_2 as determined in section 7.1, to determine the applicable emission standard. If the applicable standard is an allowable emission rate in ng/J (lb/million Btu), the allowable emission rate is used as E_{std}. If the applicable standard is an allowable percent emission, calculate the allowable emission rate (E_{std}) using the following equation:

$E_{std} = \%\ PCC/100$

Where:

% PCC = Allowable percent emission as defined by the applicable standard; percent.

7.3 *Calculate E_o^*/E_{std}.* To determine compliance for the reporting period calculate the ratio:

E_o^*/E_{std}

Where:

E_o^* = The lower confidence limit for the mean outlet emission rates, as defined in section 6.3; ng/J (lb/million Btu).

E_{std} = Allowable emission rate as defined in section 7.2; ng/J (lb/million Btu).

If E_o^*/E_{std} is equal to or less than 1.0, the facility is in compliance; if E_o^*/E_{std} is greater than 1.0, the facility is not in compliance for the reporting period.

Method 20—Determination of Nitrogen Oxides, Sulfur Dioxide, and Oxygen Emissions from Stationary Gas Turbines

1. Applicability and Principle

1.1 Applicability. This method is applicable for the determination of nitrogen oxides (NO_x), sulfur dioxide (SO_2), and oxygen (O_2) emissions from stationary gas turbines. For the NO_x and O_2 determinations, this method includes: (1) measurement system design criteria, (2) analyzer performance specifications and performance test procedures; and (3) procedures for emission testing.

1.2 Principle. A gas sample is continuously extracted from the exhaust stream of a stationary gas turbine; a portion of the sample stream is conveyed to instrumental analyzers for determination of NO_x and O_2 content. During each NO_x and OO_2 determination, a separate measurement of SO_2 emissions is made, using Method 6, or it equivalent. The O_2 determination is used to adjust the NO_x and SO_2 concentrations to a reference condition.

2. Definitions

2.1 Measurement System. The total equipment required for the determination of a gas concentration or a gas emission rate. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of a system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzers from the effects of the stack effluent.

2.1.2 NO_x Analyzer. That portion of the system that senses NO_x and generates an output proportional to the gas concentration.

2.1.3 O_2 Analyzer. That portion of the system that senses O_2 and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations.

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2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

2.5 Zero Drift. The difference in the measurement system output readings before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place and the input concentration at the time of the measurements was zero.

2.6 Calibration Drift. The difference in the measurement system output readings before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place and the input at the time of the measurements was a high-level value.

2.7 Residence Time. The elapsed time from the moment the gas sample enters the probe tip to the moment the same gas sample reaches the analyzer inlet.

2.8 Response Time. The amount of time required for the continuous monitoring system to display on the data output 95 percent of a step change in pollutant concentration.

2.9 Interference Response. The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

3. Measurement System Performance Specifications

3.1 NO_2 to NO Converter. Greater than 90 percent conversion efficiency of NO_2 to NO.

3.2 Interference Response. Less than ± 2 percent of the span value.

3.3 Residence Time. No greater than 30 seconds.

3.4 Response Time. No greater than 3 minutes.

3.5 Zero Drift. Less than ± 2 percent of the span value.

3.6 Calibration Drift. Less than ± 2 percent of the span value.

4. Apparatus and Reagents

4.1 Measurement System. Use any measurement system for NO_2 and O_2 that is expected to meet the specifications in this method. A schematic of an acceptable measurement system is shown in Figure 20-1. The essential components of the measurement system are described below:

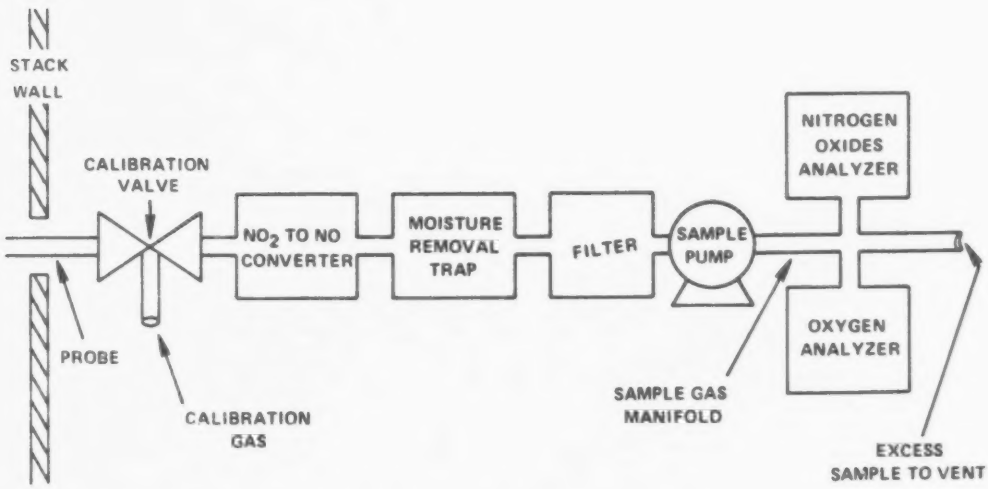

Figure 20-1. Measurement system design for stationary gas turbines.

4.1.1 Sample Probe. Heated stainless steel, or equivalent, open-ended, straight tube of sufficient length to traverse the sample points.

4.1.2 Sample Line. Heated (>95°C) stainless steel or Teflon tubing to transport the sample gas to the sample conditioners and analyzers.

4.1.3 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the sample conditioners and to the analyzers. The calibration valve assembly shall be capable of blocking the sample gas flow and of introducing calibration gases to the measurement system when in the calibration mode.

4.1.4 NO_2 to NO Converter. That portion of the system that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO). Some analyzers are designed to measure NO_x as NO_2 on a wet basis and can be used without an NO_2 to NO converter or a moisture removal trap provided the sample line to the analyzer is heated (>95°C) to the inlet of the analyzer. In addition, an NO_2 to NO converter is not necessary if the NO_2 portion of the exhaust gas is less than 5 percent of the total NO_x concentration. As a guideline, an NO_2 to NO converter is not necessary if the gas turbine is operated at 90 percent or more of peak load capacity. A converter is necessary under lower load conditions.

4.1.5 Moisture Removal Trap. A refrigerator-type condenser designed to continuously remove condensate from the sample gas. The moisture removal trap is not necessary for analyzers that can measure NO_x concentrations on a wet basis; for these analyzers, (a) heat the sample line up to the inlet of the analyzers, (b) determine the moisture content using methods subject to the approval of the Administrator, and (c) correct the NO_x and O_2 concentrations to a dry basis.

4.1.6 Particulate Filter. An in-stack or an out-of-stack glass fiber filter, of the type specified in EPA Reference Method 5; however, an out-of-stack filter is recommended when the stack gas temperature exceeds 250 to 300°C.

4.1.7 Sample Pump. A nonreactive leak-free sample pump to pull the sample gas through the system at a flow rate sufficient to minimize transport delay. The pump shall be made from stainless steel or coated with Teflon or equivalent.

4.1.8 Sample Gas Manifold. A sample gas manifold to divert portions of the sample gas stream to the analyzers. The manifold may be constructed of glass, Teflon, type 316 stainless steel, or equivalent.

4.1.9 Oxygen and Analyzer. An analyzer to determine the percent O_2 concentration of the sample gas stream.

4.1.10 Nitrogen Oxides Analyzer. An analyzer to determine the ppm NO_x concentration in the sample gas stream.

4.1.11 Data Output. A strip-chart recorder, analog computer, or digital recorder for recording measurement data.

4.2 Sulfur Dioxide Analysis. EPA Reference Method 6 apparatus and reagents.

4.3 NO_x Caliberation Gases. The calibration gases for the NO_x analyzer may be NO in N_2, NO_2 in air or N_2, or NO and NO_2 in N_2. For NO_x measurement analyzers that require oxidation of NO to NO_2, the calibration gases must be in the form of NO in N_2. Use four calibration gas mixtures as specified below:

4.3.1 High-level Gas. A gas concentration that is equivalent to 80 to 90 percent of the span value.

4.3.2 Mid-level Gas. A gas concentration that is equivalent to 45 to 55 percent of the span value.

4.3.3 Low-level Gas. A gas concentration that is equivalent to 20 to 30 percent of the span value.

4.3.4 Zero Gas. A gas concentration of less than 0.25 percent of the span value. Ambient air may be used for the NO_x zero gas.

4.4 O_2 Calibration Gases. Use ambient air at 20.9 percent as the high-level O_2 gas. Use a gas concentration that is equivalent to 11-14 percent O_2 for the mid-level gas. Use purified nitrogen for the zero gas.

4.5 NO_2/NO Gas Mixture. For determining the conversion efficiency of the NO_2 to NO converter, use a calibration gas mixture of NO_2 and NO in N_2. The mixture will be known concentrations of 40 to 60 ppm NO_2 and 90 to 110 ppm NO and certified by the gas manufacturer. This certification of gas concentration must include a brief description of the procedure followed in determining the concentrations.

5. Measurement System Performance Test Procedures

Perform the following procedures prior to measurement of emissions (Section 8) and only once for each test program, i.e., the series of all test runs for a given gas turbine engine.

5.1 Calibration Gas Checks. There are two alternatives for checking the concentrations of the calibration gases. (a) The first is to use calibration gases that are documented traceable to National Bureau of Standards Reference Materials. Use *Traceability Protocol for Establishing True Concentrations of Gases Used for Calibrations and Audits of Continuous Source Emission Monitors* (Protocol Number 1) that is available from the Environmental Monitoring and Support Laboratory, Quality Assurance Branch, Mail Drop 77, Environmental Protection Agency, Research Triangle Park,

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North Carolina 27711. Obtain a certification from the gas manufacturer that the protocol was followed. These calibration gases are not to be analyzed with the Reference Methods. (b) The second alternative is to use calibration gases not prepared according to the protocol. If this alternative is chosen, within 1 month prior to the emission test, analyze each of the calibration gas mixtures in triplicate using Reference Method 7 or the procedure outlined in Citation 8.1 for NO_x and use Reference Method 3 for O_2. Record the results on a data sheet (example is shown in Figure 20-2). For the low-level, mid-level, or high-level gas mixtures, each of the individual NO_x analytical results must be within 10 percent (or 10 ppm, whichever is greater) of the triplicate set average (O_2 test results must be within 0.5 percent O_2); otherwise, discard the entire set and repeat the triplicate analyses. If the average of the triplicate reference method test results is within 5 percent for NO_x gas or 0.5 percent O_2 for the O_2 gas of the calibration gas manufacturer's tag value, use the tag value; otherwise, conduct at least three additional reference method test analyses until the results of six individual NO_x runs (the three original plus three additional) agree within 10 percent (or 10 ppm, whichever is greater) of the average (O_2 test results must be within 0.5 percent O_2). Then use this average for the cylinder value.

5.2 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing and operating the NO_2 to NO converter, the NO_x analyzer, the O_2 analyzer, and other components.

Date _____ (Must be within 1 month prior to the test period)

Reference method used _____

Sample run	Gas concentration, ppm		
	Low level[a]	Mid level[b]	High level[c]
1			
2			
3			
Average			
Maximum % deviation[d]			

[a] Average must be 20 to 30% of span value.

[b] Average must be 45 to 55% of span value.

[c] Average must be 80 to 90% of span value.

[d] Must be $\leq \pm$ 10% of applicable average or 10 ppm, whichever is greater.

Figure 20-2. Analysis of calibration gases.

5.3 Calibration Check. Conduct the calibration checks for both the NO_x and the O_2 analyzers as follows:

5.3.1 After the measurement system has been prepared for use (Section 5.2), introduce zero gases and the mid-level calibration gases; set the analyzer output responses to the appropriate levels. Then introduce each of the remainder of the calibration gases described in Sections 4.3 or 4.4, one at a time, to the measurement system. Record the responses on a form similar to Figure 20-3.

5.3.2 If the linear curve determined from the zero and mid-level calibration gas responses does not predict the actual response of the low-level (not applicable for the O_2 analyzer) and high-level gases within ±2 percent of the span value, the calibration shall be considered invalid. Take corrective measures on the measurement system before proceeding with the test.

5.4 Interference Response. Introduce the gaseous components listed in Table 20-1 into the measurement system separately, or as gas mixtures. Determine the total interference output response of the system to these components in concentration units; record the values on a form similar to Figure 20-4. If the sum of the interference responses of the test gases for either the NO_x or O_2 analyzers is greater than 2 percent of the applicable span value, take corrective measure on the measurement system.

Turbine type: _____ Identification number _____

Date: _____ Test number _____

Analyzer type: _____ Identification number _____

	Cylinder value, ppm or %	Initial analyzer response, ppm or %	Final analyzer responses, ppm or %	Difference: initial-final, ppm or %
Zero gas				
Low - level gas				
Mid - level gas				
High - level gas				

$$\text{Percent drift} = \frac{\text{Absolute difference}}{\text{Span value}} \times 100.$$

Figure 20-3. Zero and calibration data.

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TABLE 20-1—INTERFERENCE TEST GAS CONCENTRATION

CO	500±50 ppm	CO_2	10±1 percent.
SO_2	200±20 ppm	O_2	20.9±1 percent.

Date of test: _____

Analyzer type: _____ Serial No. _____

Test gas type	Concentration, ppm	Analyzer output response	% of span

$$\% \text{ of span} = \frac{\text{Analyzer output response}}{\text{Instrument span}} \times 100.$$

Figure 20-4. Interference response.

Conduct an interference response test of each analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response, e.g., changes in the type of gas detector.

In lieu of conducting the interference response test, instrument vendor data, which demonstrate that for the test gases of Table 20–1 the interference performance specification is not exceeded, are acceptable.

5.5 Residence and Response Time.

5.5.1 Calculate the residence time of the sample interface portion of the measurement system using volume and pump flow rate information. Alternatively, if the response time determined as defined in Section 5.5.2 is less than 30 seconds, the calculations are not necessary.

5.5.2 To determine response time, first introduce zero gas into the system at the calibration valve until all readings are stable; then, switch to monitor the stack effluent until a stable reading can be obtained. Record the upscale response time. Next, introduce high-level calibration gas into the system. Once the system has stabilized at the high-level concentration, switch to monitor the stack effluent and wait until a stable value is reached. Record the downscale response time. Repeat the procedure three times. A stable value is equivalent to a change of less than 1 percent of span value for 30 seconds or less than 5 percent of the measured average concentration for 2 minutes. Record the response time data on a form similar to Figure 20–5, the readings of the upscale or downscale reponse time, and report the greater time as the "response time" for the analyzer. Conduct a response time test prior to the initial field use of the measurement system, and repeat if changes are made in the measurement system.

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Date of test _____

Analyzer type _____ S/N _____

Span gas concentration _____ ppm

Analyzer span setting _____ ppm

Upscale	1 _____	seconds
	2 _____	seconds
	3 _____	seconds

Average upscale response _____ seconds

Downscale	1 _____	seconds
	2 _____	seconds
	3 _____	seconds

Average downscale response _____ seconds

System response time = slower average time = _____ seconds.

Figure 20-5. Response time

5.6 NO_2, NO Conversion Efficiency. Introduce to the system, at the calibration valve assembly, the NO_2/NO gas mixture (Section 4.5). Record the response of the NO_x analyzer. If the instrument response indicates less than 90 percent NO_2 to NO conversion, make corrections to the measurement system and repeat the check. Alternatively, the NO_2 to NO converter check described in Title 40 Part 86: *Certification and Test Procedures for Heavy-Duty Engines for 1979 and Later Model Years* may be used. Other alternate procedures may be used with approval of the Administrator.

6. Emission Measurement Test Procedure

6.1 Preliminaries.

6.1.1 Selection of a Sampling Site. Select a sampling site as close as practical to the exhaust of the turbine. Turbine geometry, stack configuration, internal baffling, and point of introduction of dilution air will vary for different turbine designs. Thus, each of these factors must be given special consideration in order to obtain a representative sample. Whenever possible, the sampling site shall be located upstream of the point of introduction of dilution air into the duct. Sample ports may be located before or after the upturn elbow, in order to accommodate the configuration of the turning vanes and baffles and to permit a complete, unobstructed traverse of the stack. The sample ports shall not be located within 5 feet or 2 diameters (whichever is less) of the gas discharge to atmosphere. For supplementary-fired, combined-cycle plants, the sampling site shall be located between the gas turbine and the boiler. The diameter of the sample ports shall be sufficient to allow entry of the sample probe.

6.1.2 A preliminary O_2 traverse is made for the purpose of selecting low O_2 values. Conduct this test at the turbine condition that is the lowest percentage of peak load operation included in the program. Follow the procedure below or alternative procedures subject to the approval of the Administrator may be used:

6.1.2.1 Minimum Number of Points. Select a minimum number of points as follows: (1) eight, for stacks having cross-sectional areas less than 1.5 m^2 (16.1 ft^2); (2) one sample point for each 0.2 m^2 (2.2 ft^2 of areas, for stacks of 1.5 m^2 to 10.0 m^2 (16.1-107.6 ft^2) in cross-sectional area; and (3) one sample point for each 0.4 m^2 (4.4 ft^2) of area, for stacks greater than 10.0 m^2 (107.6 ft^2) in cross-sectional area. Note that for circular ducts, the number of sample points must be a multiple of 4, and for rectangular ducts, the number of points must be one of those listed in Table 20-2; therefore, round off the number of points (upward), when appropriate.

6.1.2.2 Cross-sectional Layout and Location of Traverse Points. After the number of traverse points for the preliminary O^2 sampling has been determined, use Method 1 to located the traverse points.

6.1.2.3 Preliminary O^2 Measurement. While the gas turbine is operating at the lowest percent of peak load, conduct a preliminary O^2 measurement as follows: Position the probe at the first traverse point and begin sampling. The minimum sampling time at each point shall be 1 minute plus the average system response time. Determine the average steady-state concentration of O^2 at each point and record the data on Figure 20-6.

6.1.2.4 Selection of Emission Test Sampling Points. Select the eight sampling points at which the lowest O^2 concentration were obtained. Use these same points for all the test runs at the different turbine load conditions. More than eight points may be used, if desired.

TABLE 20-2.—CROSS-SECTIONAL LAYOUT FOR RECTANGULAR STACKS

	Matrix layout
No. of traverse points:	
9	3 x 3
12	4 x 3
16	4 x 4
20	5 x 4
25	5 x 5
30	6 x 5
36	6 x 6
42	7 x 6
49	7 x 7

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Location: Date _____

Plant _____

City, State _____

Turbine identification:

Manufacturer _____

Model, serial number _____

Sample point	Oxygen concentration, ppm

Figure 20-6. Preliminary oxygen traverse.

6.2 NO_x and O_2 Measurement. This test is to be conducted at each of the specified load conditions. Three test runs at each load condition constitute a complete test.

6.2.1 At the beginning of each NO_x test run and, as applicable, during the run, record turbine data as indicated in Figure 20-7. Also, record the location and number of the traverse points on a diagram.

6.2.2 Position the probe at the first point determined in the preceding section and begin sampling. The minimum sampling time at each point shall be at least 1 minute plus the average system response time. Determine the average steady-state concentration of O_2 and NO_x at each point and record the data on Figure 20-8.

TURBINE OPERATION RECORD

Test operator _____ Date _____

Turbine identification:
Type _____
Serial No. _____

Location:
Plant _____
City _____

Ambient temperature _____

Ambient humidity _____

Test time start _____

Test time finish _____

Fuel flow rate[a] _____

Water or steam Flow rate[a] _____

Ambient Pressure _____

Ultimate fuel Analysis
C _____
H _____
O _____
N _____
S _____
Ash _____
H_2O _____

Trace Metals
_____
Na _____
Va _____
K _____
etc[b] _____

Operating load _____

[a]Describe measurement method, i.e., continuous flow meter, start finish volumes, etc.

[b]i.e., additional elements added for smoke suppression.

Figure 20-7. Stationary gas turbine data.

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Turbine identification:

Manufacturer _____

Model, serial No. _____

Location:

Plant _____

City, State _____

Ambient temperature _____

Ambient pressure _____

Date _____

Test time - start _____

Test time - finish _____

Test operator name _____

O_2 instrument type _____

Serial No. _____

NO_x instrument type _____

Serial No. _____

Sample point	Time, min.	O_2^a, %	NO_x^a, ppm

[a]Average steady-state value from recorder or instrument readout.

Figure 20-8. Stationary gas turbine sample point record.

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6.2.3 After sampling the last point, conclude the test run by recording the final turbine operating parameters and by determining the zero and calibration drift, as follows:

Immediately following the test run at each load condition, or if adjustments are necessary for the measurement system during the tests, reintroduce the zero and mid-level calibration gases as described in Sections 4.3, and 4.4, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after the drift checks are made). Record the analyzers' responses on a form similar to Figure 20-3. If the drift values exceed the specified limits, the test run preceding the check is considered invalid and will be repeated following corrections to the measurement system. Alternatively, the test results may be accepted provided the measurement system is recalibrated and the calibration data that result in the highest corrected emission rate are used.

6.3 SO_2 Measurement. This test is conducted only at the 100 percent peak load condition. Determine SO_2 using Method 6, or equivalent, during the test. Select a minimum of six total points from those required for the NO_x measurements; use two points for each sample run. The sample time at each point shall be at least 10 minutes. Average the O_2 readings taken during the NO_x test runs at sample points corresponding to the SO_2 traverse points (see Section 6.2.2) and use this average O_2 concentration to correct the integrated SO_2 concentration obtained by Method 6 to 15 percent O_2 (see Equation 20-1).

If the applicable regulation allows fuel sampling and analysis for fuel sulfur content to demonstrate compliance with sulfur emission unit, emission sampling with Reference Method 6 is not required, provided the fuel sulfur content meets the limits of the regulation.

7. *Emission Calculations*

7.1 Correction to 15 Percent Oxygen. Using Equation 20-1, calculate the NO_x and SO_2 concentrations (adjusted to 15 percent O_2). The correction to 15 percent O_2 is sensitive to the accuracy of the O_2 measurement. At the level of analyzer drift specified in the method (±2 percent of full scale), the change in the O_2 concentration correction can exceed 10 percent when the O_2 content of the exhaust is above 16 percent O_2. Therefore O_2 analyzer stability and careful calibration are necessary.

$$C_{adj} = C_{meas} \times \frac{5.9}{20.9 - \%\ O_2} \qquad \text{(Equation 20-1)}$$

Where:

C_{adj} = Pollutant concentration adjusted to 15 percent O_2 (ppm)

C_{meas} = Pollutant concentration measured, dry basis (ppm)

5.9 = 20.9 percent O_2 − 15 percent O_2, the defined O_2 correction basis

Percent O_2 = Percent O_2 measured, dry basis (%)

7.2 Calculate the average adjusted NO_x concentration by summing the point values and dividing by the number of sample points.

8. *Citations*

8.1 Curtis, F. A Method for Analyzing NO_x Cylinder Gases-Specific Ion Electrode Procedure, Monograph available from Emission Measurement Laboratory, ESED, Research Triangle Park, N.C. 27711, October 1978.

Method 24—Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

1. *Applicability and Principle*

1.1 Applicability. This method applies to the determination of volatile matter content, water content, density, volume solids, and weight solids of paint, varnish, lacquer, or related surface coatings.

1.2 Principle. Standard methods are used to determine the volatile matter content, water content, density, volume solids, and weight solids of the paint, varnish, lacquer, or related surface coatings.

2. *Applicable Standard Methods*

Use the apparatus, reagents, and procedures specified in the standard methods below:

2.1 ASTM D 1475-60. Standard Method of Test for Density of Paint, Lacquer, and Related Products.

2.2 ASTM D 2369-81. Provisional Method of Test for Volatile Content of Paints.

2.3 ASTM D 3792-79. Standard Method of Test for Water in Water Reducible Paint by Direct Injection into a Gas Chromatograph.

2.4 ASTM Provisional Method of Test for Water in Paint or Related Coatings by the Karl Fischer Titration Method.

3. *Procedure*

3.1 Volatile Matter Content. Use the procedure in ASTM D 2369-81 to determine the volatile matter content (may include water)

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of the coating. Record the following information:

W_1 = Weight of dish and sample before heating, g.

W_2 = Weight of dish and sample after heating, g.

W_s = Sample weight, g.

Run analyses in pairs (duplicate sets) for each coating until the criterion in section 4.3 is met. Calculate the weight fraction of the volatile matter (W_v) for each analysis as follows:

$$W_v = \frac{W_1 - W_2}{W_s} \qquad \text{Eq. 24-1}$$

Record the arithmetic average (W_v).

3.2 Water Content. For waterborne (water reducible) coatings only, determine the weight fraction of water (W_w) using either "Standard Method of Test for Water in Water Reducible Paint by Direct Injection into a Gas Chromatograph" or "Provisional Method of Test for Water in Paint or Related Coatings by the Karl Fischer Titration Method." A waterborne coating is any coating which contains more than 5 percent water by weight in its volatile fraction. Run duplicate sets of determinations until the criterion in section 4.3 is met. Record the arithmetic average (W_w).

3.3 Coating Density. Determine the density (D_c, kg/liter) of the surface coating using the procedure in ASTM D 1475–60.

Run duplicate sets of determinations for each coating until the criterion in section 4.3 is met. Record the arithmetic average (D_c).

3.4 Solids Content. Determine the volume fraction (V_s) solids of the coating by calculation using the manufacturer's formulation.

4. Data Validation Procedure

4.1 Summary. The variety of coatings that may be subject to analysis makes it necessary to verify the ability of the analyst and the analytical procedures to obtain reproducible results for the coatings tested. This is done by running duplicate analyses on each sample tested and comparing results with the within-laboratory precision statements for each parameter. Because of the inherent increased imprecision in the determination of the VOC content of waterborne coatings as the weight percent water increases, measured parameters for waterborne coatings are modified by the appropriate confidence limits based on between-laboratory precision statements.

4.2 Analytical Precision Statements. The within-laboratory and between-laboratory precision statements are given below:

	Within-laboratory	Between-laboratory
Volatile matter content, W_v	1.5 pct W_v	4.7 pct W_v.
Water content, W_w	2.9 pct W_w	7.5 pct W_w.
Density, D_c	0.001 kg/liter	0.002 kg/liter.

4.3 Sample Analysis Criteria. For W_v and W_w, run duplicate analyses until the difference between the two values in a set is less than or equal to the within-laboratory precision statement for that parameter. For D_c run duplicate analyses until each value in a set deviates from the mean of the set by no more than the within-laboratory precision statement. If after several attempts it is concluded that the ASTM procedures cannot be used for the specific coating with the established within-laboratory precision, the Administrator will assume responsibility for providing the necessary procedures for revising the method or precision statements upon written request to: Director, Emission Standards and Engineering Division, (MD-13) Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

4.4 Confidence Limit Calculations for Waterborne Coatings. Based on the between-laboratory precision statements, calculate the confidence limits for waterborne coatings as follows:

To calculate the lower confidence limit, subtract the appropriate between-laboratory precision value from the measured mean value for that parameter. To calculate the upper confidence limit, add the appropirate between-laboratory precision value to the measured mean value for that parameter. For W_v and D_c, use the lower confidence limits, and for W_w, use the upper confidence limit. Because V_s is calculated, there is no adjustment for the parameter.

5. Calculations

5.1 Nonaqueous Volatile Matter.

5.1.1 Solvent-borne Coatings.

$$W_o = W_v \qquad \text{Eq. 24-2}$$

Where:

W_o = Weight fraction nonaqueous volatile matter, g/g.

5.1.2 Waterborne Coatings.

$$W_o = W_v - W_w \qquad \text{Eq. 24-3}$$

5.2 Weight fraction solids.

$$W_s = 1 - W_v \qquad \text{Eq. 24-4}$$

Where: W_s = Weight solids, g/g.

6. Bibliography

6.1 Provisional Method Test for Volatile Content of Paints. Available from: Chairman, Committee D-1 on Paint and Related Coatings and Materials, American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. ASTM Designation D 2369-81.

6.2 Standard Method of Test for Density of Paint, Varnish, Lacquer, and Related Products. In: 1980 Book of ASTM Standards, Part 27. Philadelphia, Pennsylvania, ASTM Designation D 1475-60. 1980.

6.3 Standard Method of Test for Water in Water Reducible Paint by Direct Injection into a Gas Chromatograph. Available from: Chairman, Committee D-1 on Paint and Related Coatings and Materials, American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. ASTM Designation D 3792-79.

6.4 Provisional Method of Test Water in Paint or Related Coatings by the Karl Fischer Titration Method. Available from: Chairman, Committee D-1 on Paint and Related Coatings and Materials, American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

METHOD 25—DETERMINATION OF TOTAL GASEOUS NONMETHANE ORGANIC EMISSIONS AS CARBON

1. Applicability and Principle

1.1 Applicability. This method applies to the measurement of volatile organic compounds (VOC) as total gaseous nonmethane organics (TGNMO) as carbon in source emissions. Organic particulate matter will interfere with the analysis and therefore, in some cases, an in-stack particulate filter is required. This method is not the only method that applies to the measurement of TGNMO. Costs, logistics, and other practicalities of source testing may make other test methods more desirable for measuring VOC of certain effluent streams. Proper judgment is required in determining the most applicable VOC test method. For example, depending upon the molecular weight of the organics in the effluent stream, a totally automated semi-continuous nonmethane organic (NMO) analyzer interfaced directly to the source may yield accurate results. This approach has the advantage of providing emission data semi-continuously over an extended time period.

Direct measurement of an effluent with a flame ionization detector (FID) analyzer may be appropriate with prior characterization of the gas stream and knowledge that the detector responds predictably to the organic compounds in the stream. If present, methane will, of course, also be measured. In practice, the FID can be applied to the determination of the mass concentration of the total molecular structure of the organic emissions under the following limited conditions: (1) Where only one compound is known to exist; (2) when the organic compounds consist of only hydrogen and carbon; (3) where the relative percentage of the compounds is known or can be determined, and the FID response to the compounds is known; (4) where a consistent mixture of compounds exists before and after emission control and *only* the relative concentrations are to be assessed; or (5) where the FID can be calibrated against mass standards of the compounds emitted (solvent emissions, for example).

Another example of the use of a direct FID is as a screening method. If there is enough information available to provide a rough estimate of the analyzer accuracy, the FID analyzer can be used to determine the VOC content of an uncharacterized gas stream. With a sufficient buffer to account for possible inaccuracies, the direct FID can be a useful tool to obtain the desired results without costly exact determination.

In situations where a qualitative/quantitative analysis of an effluent stream is desired or required, a gas chromatographic FID system may apply. However, for sources emitting numerous organics, the time and expense of this approach will be formidable.

1.2 Principle. An emission sample is withdrawn from the stack at a constant rate through a chilled condensate trap by means of an evacuated sample tank. TGNMO are determined by combining the analytical results obtained from independent analyses of the condensate trap and sample tank fractions. After sampling is completed, the organic contents of the condensate trap are oxidized to carbon dioxide (CO_2) which is quantitatively collected in an evacuated vessel; then a portion of the CO_2 is reduced to methane (CH_4) and measured by a FID. The organic content of the sample fraction collected in the sampling tank is measured by injecting a portion into a gas chromatographic (GC) column to achieve separation of the nonmethane organics from carbon monoxide (CO), CO_2 and CH_4; the nonmethane organics (NMO) are oxidized to CO_2, reduced to CH_4, and measured by a FID. In this manner, the variable response of the FID associated with different types of organics is eliminated.

2. Apparatus

The sampling system consists of a condensate trap, flow control system, and sample tank (Figure 1). The analytical system consists of two major sub-systems: an oxidation system for the recovery and conditioning of the condensate trap contents and a NMO analyzer. The NMO analyzer is a GC with backflush capability for NMO analysis and

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is equipped with an oxidation catalyst, reduction catalyst, and FID. (Figures 2 and 3 are schematics of a typical NMO analyzer.) The system for the recovery and conditioning of the organics captured in the condensate trap consists of a heat source, oxidation catalyst, nondispersive infrared (NDIR) analyzer, and an intermediate collection vessel (Figure 4 is a schematic of a typical system.) TGNMO sampling equipment can be constructed from commercially available components and components fabricated in a machine shop. NMO analyzers are available commercially or can be constructed from available components by a qualified instrument laboratory.

2.1 Sampling. The following equipment is required:

2.1.1 Probe. 3.2-mm OD (⅛-in.) stainless steel tubing.

2.1.2 Condensate Trap. Constructed of 316 stainless steel; construction details of a suitable trap are shown in Figure 5.

2.1.3 Flow Shut-off Valve. Stainless steel control valve for starting and stopping sample flow.

2.1.4 Flow Control System. Any system capable of maintaining the sampling rate to within ±10 percent of the selected flow rate (50 to 100 cc/min range).

2.1.5 Vacuum Gauge. Gauge for monitoring the vacuum of the sample tank during leak checks and sampling.

2.1.6 Sample Tank. Stainless steel or aluminum tank with a volume of 4 to 8 liters, equipped with a stainless steel female quick connect for assembly to the sample train and analytical system.

2.1.7 Mercury Manometer. U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0-900 mm range.

2.1.8 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2 Analysis. The following equipment is required:

2.2.1 Condensate Recovery and Conditioning Apparatus. An apparatus for recovering and catalytically oxidizing the condensate trap contents is required. Figure 4 is a schematic of such a system. The analyst must demonstrate prior to initial use that the analytical system is capable of proper oxidation and recovery, as specified in section 5.1. The condensate recovery and conditioning apparatus consists of the following major components.

2.2.1.1 Heat Source. A heat source sufficient to heat the condensate trap (including probe) to a temperature where the trap turns a "dull red" color. A system using both a propane torch and an electric muffle-type furnace is recommended.

2.2.1.2 Oxidation Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.1.2). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.1.3 Water Trap. Any leak-proof moisture trap capable of removing moisture from the gas stream.

2.2.1.4 NDIR Detector. A detector capable of indicating CO_2 concentration in the zero to 1 percent range. This detector is required for monitoring the progress of combustion of the organic compounds from the condensate trap.

2.2.1.5 Pressure Regulator. Stainless steel needle valve required to maintain the trap conditioning system at a near constant pressure.

2.2.1.6 Intermediate Collection Vessel. Stainless steel or aluminum collection vessel equipped with a female quick connect. Tanks with nominal volumes in the 1 to 4 liter range are recommended.

2.2.1.7 Mercury Manometer. U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0-900 mm range.

2.2.1.8 Gas Purifiers. Gas purification systems sufficient to maintain CO_2 and organic impurities in the carrier gas and auxiliary oxygen at a level of less than 10 ppm (may not be required depending on quality of cylinder gases used).

2.2.2 NMO Analyzer. Semi-continuous GC/FID analyzer capable of: (1) separating CO, CO_2, and CH_4 from nonmethane organic compounds, (2) reducing the CO_2 to CH_4 and quantifying as CH_4 and (3) oxidizing the nonmethane organic compounds to CO_2, reducing the CO_2 to CH_4 and quantifying as CH_4. The analyst must demonstrate prior to initial use that the analyzer is capable of proper separation, oxidation, reduction, and measurement (section 5.2). The analyzer consists of the following major components:

2.2.2.1 Oxidation Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.1). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.2 Reduction Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.3). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.3 Separation Column(s). Gas chromatographic column(s) capable of separating CO, CO_2, and CH_4 from NMO compounds as demonstrated according to the procedures established in this method (section 5.2.5). Addendum I of this method lists a column found to be acceptable.

2.2.2.4 Sample Injection System. A GC sample injection valve fitted with a sample loop properly sized to interface with the NMO analyzer (1 cc loop recommended).

2.2.2.5 FID. A FID meeting the following specifications is required.

2.2.2.5.1 Linearity. A linear response (± 5%) over the operating range as demonstrated by the procedures established in section 5.2.2.

2.2.2.5.2 Range. Signal attenuators shall be available to produce a minimum signal response of 10 percent of full scale for a full scale range of 10 to 50000 ppm CH_4.

2.2.2.6 Data Recording System. Analog strip chart recorder or digital intergration system compatible with the FID for permanently recording the analytical results.

2.2.3 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 1 mm Hg.

2.2.4 Thermometer. Capable of measuring the labcratory temperature within 1°C.

2.2.5 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2.6 Syringe (2). 10 μl and 100 μl liquid injection syringes.

2.2.7 Liquid Sample Injection Unit. 316 SS U-tube fitted with a Teflon injection septum, see Figure 6.

3. Reagents

3.1 Sampling. Crushed dry ice is required during sampling.

3.2 Analysis.

3.2.1 NMO Analyzer. The following gases are needed:

3.2.1.1 Carrier Gas. Zero grade gas containing less than 1 ppm C. Addendum I of this method lists a carrier gas found to be acceptable.

3.2.1.2 Fuel Gas. Pure hydrogen, containing less than 1 ppm C.

3.2.1.3 Combustion Gas. Zero grade air or oxygen as required by the detector.

3.2.2 Condensate Recovery and Conditioning Apparatus.

3.2.2.1 Carrier Gas. Five percent O_2 in N_2, containing less than 1 ppm C.

3.2.2.2 Auxiliary Oxygen. Zero grade oxygen containing less than 1 ppm C.

3.2.2.3 Hexane. ACS grade, for liquid injection.

3.2.2.4 Toluene. ACS grade, for liquid injection.

3.3 Calibration. For all calibration gases, the manufacturer must recommend a maximum shelf life for each cylinder (i.e., the length of time the gas concentration is not expected to change more than ± 5 percent from its certified value). The date of gas cylinder preparation, certified organic concentration and recommended maximum shelf life must be affixed to each cylinder before shipment from the gas manufacturer to the buyer. The following calibration gases are required.

3.3.1 Oxidation Catalyst Efficiency Check Calibration Gas. Gas mixture standard with nominal concentration of 1 percent methane in air.

3.3.2 Flame Ionization Detector Linearity and Nonmethane Organic Calibration Gases (3). Gas mixture standards with nominal propane concentrations of 20 ppm, 200 ppm, and 3000 ppm, in air.

3.3.3 Carbon Dioxide Calibration Gases (3). Gas mixture standards with nominal CO_2 concentrations of 50 ppm, 500 ppm, and 1 percent, in air.

NOTE: total NMO less than 1 ppm required for 1 percent mixture.

3.3.4 NMO Analyzer System Check Calibration Gases (4).

3.3.4.1 Propane Mixture. Gas mixture standard containing (nominal) 50 ppm CO, 50 ppm CH_4, 2 percent CO_2, and 20 ppm C_3H_8, prepared in air.

3.3.4.2 Hexane. Gas mixture standard containing (nominal) 50 ppm hexane in air.

3.3.4.3 Toluene. Gas mixture standard containing (nominal) 20 ppm toluene in air.

3.3.4.4 Methanol. Gas mixture standard containing (nominal) 100 ppm methanol in air.

4. Procedure

4.1 Sampling.

4.1.1 Sample Tank Evacuation and Leak Check. Either in the laboratory or in the field, evacuate the sample tank to 10 mm Hg absolute pressure or less (measured by a mercury U-tube manometer) then leak check the sample tank by isolating the tank from the vacuum pump and allowing the tank to sit for 10 minutes. The tank is acceptable if no change in tank vacuum is noted.

4.1.2 Sample Train Assembly. Just prior to assembly, measure the tank vaccuum using a mercury U-tube manometer. Record this vaccum (P_u), the ambient temperature (T_u), and the barometric pressure (P_{bl}) at this time. Assuring that the flow shut-off valve is in the closed position, assemble the sampling system as shown in Figure 1. Immerse the condensate trap body in dry ice to within 2.5 or 5 cm of the point where the inlet tube joins the trap body.

4.1.3. Pretest Leak Check. A pretest leak check is required. After the sampling train is assembled, record the tank vacuum as indicated by the vaccum gauge. Wait a minimum period of 10 minutes and recheck the indicated vacuum. If the vacuum has not changed, the portion of the sampling train behind the shut-off valve does not leak and is considered acceptable. To check the front portion of the sampling train, assure that the probe tip is tightly plugged and then open the sample train flow shut-off valve. Allow the sample train to sit for a minimum period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the pretest leak rate (cm/Hg per 10 minutes). At the completion of the leak check period, close the sample flow shut-off valve.

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4.1.4. Sample Train Operation. Place the probe into the stack such that the probe is perpendicular to the direction of stack gas flow; locate the probe tip at a single preselected point. If a probe extension which will not be analyzed as part of the condensate trap is being used assure that at least a 15 cm section of the probe which will be analyzed with the trap is in the stack effluent. For stacks having a negative static pressure, assure that the sample port is sufficiently sealed to prevent air in-leakage around the probe. Check the dry ice level and add ice if necessary. Record the clock time and sample tank gauge vacuum. To begin sampling, open the flow shut-off valve and adjust (if applicable) the control valve of the flow control system used in the sample train; maintain a constant flow rate (±10 percent) throughout the duration of the sampling period. Record the gauge vacuum and flowmeter setting (if applicable) at 5-minute intervals. Select a total sample time greater than or equal to the minimum sampling time specified in the applicable subpart of the regulation; end the sampling when this time period is reached or when a constant flow rate can no longer be maintained due to reduced sample tank vacuum. When the sampling is completed, close the flow shut-off valve and record the final sample time and guage vacuum readings.

NOTE: If the sampling had to be stopped before obtaining the minimum sampling time (specified in the applicable subpart) because a constant flow rate could not be maintained, proceed as follows: After removing the probe from the stack, remove the used sample tank from the sampling train (without disconnecting other portions of the sampling train) and connect another sample tank to the sampling train. Prior to attaching the new tank to the sampling train, assure that the tank vacuum (measured on-site by the U-tube manometer) has been recorded on the data form and that the tank has been leak-checked (on-site). After the new tank is attached to the sample train, proceed with the sampling until the required minimum sampling time has been exceeded.

4.1.5 Post Test Leak Check. A leak check is mandatory at the conclusion of each test run. After sampling is completed, remove the probe from the stack and plug the probe tip. Open the sample train flow shut-off valve and monitor the sample tank vacuum gauge for a period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the post test leak rate (cm Hg per 10 minutes). If the sampling train does not pass the post leak check, invalidate the run or use a procedure acceptable to the Administrator to adjust the data.

4.2 Sample Recovery. After the post test leak check is completed, disconnect the condensate trap at the flow metering system and tightly seal both ends of the condensate trap. Keep the trap packed in dry ice until the samples are returned to the laboratory for analysis. Remove the flow metering system from the sample tank. Attach the U-tube manometer to the tank (keep length of connecting line to a minimum) and record the final tank vacuum (P_t); record the tank temperature (T_t) and barometric pressure at this time. Disconnect the manometer from the tank. Assure that the test run number is properly identified on the condensate trap and the sample tank(s).

4.3 Condensate Recovery and Conditioning. Prepare the condensate recovery and conditioning apparatus by setting the carrier gas flow rate and heating the catalyst to its operating temperature. Prior to initial use of the condensate recovery and conditioning apparatus, a system performance test must be conducted according to the procedures established in section 5.1 of this method. After successful completion of the initial performance test, the system is routinely used for sample conditioning according to the following procedures:

4.3.1 System Blank and Catalyst Efficiency Check. Prior to and immediately following the conditioning of each set of sample traps, or on a daily basis (whichever occurs first) conduct the carrier gas blank test and catalyst efficiency test as specified in sections 5.1.1 and 5.1.2 of this method. Record the carrier gas initial and final blank values, B_{ti} and B_{tf}, respectively. If the criteria of the tests cannot be met, make the necessary repairs to the system before proceeding.

4.3.2 Condensate Trap Carbon Dioxide Purge and Sample Tank Pressurization. The first step in analysis is to purge the condensate trap of any CO_2 which it may contain and to simultaneously pressurize the sample tank. This is accomplished as follows: Obtain both the sample tank and condensate trap from the test run to be analyzed. Set up the condensate recovery and conditioning apparatus so that the carrier flow bypasses the condensate trap hook-up terminals, bypasses the oxidation catalyst, and is vented to the atmosphere. Next, attach the condensate trap to the apparatus and pack the trap in dry ice. Assure that the valves isolating the collection vessel connection from the atmospheric vent and the vacuum pump are closed and then attach the sample tank to the system as if it were the intermediate collection vessel. Record the tank vacuum on the laboratory data form. Assure that the NDIR analyzer indicates a zero output level and then switch the carrier flow through the condensate trap; immediately switch the carrier flow

from vent to collect. The condensate trap recovery and conditioning apparatus should now be set up as indicated in Figure 8. Monitor the NDIR; when CO_2 is no longer being passed through the system, switch the carrier flow so that it once again bypasses the condensate trap. Continue in this manner until the gas sample tank is pressurized to a nominal gauge pressure of 800 mm Hg. At this time, isolate the tank, vent the carrier flow, and record the sample tank pressure (P_{tf}), barometric pressure (P_{bf}), and ambient temperature (T_{tf}). Remove the sample tank from the system.

4.3.3 Recovery of Condensate Trap Sample. Oxidation and collection of the sample in the condensate trap is now ready to begin. From the step just completed in section 4.3.1.2 above, the system should be set up so that the carrier flow bypasses the condensate trap, bypasses the oxidation catalyst, and is vented to the atmosphere. Attach an evacuated intermediate collection vessel to the system and then switch the carrier so that it flows through the oxidation catalyst. Switch the carrier from vent to collect and open the valve to the collection vessel; remove the dry ice from the trap and then switch the carrier flow through the trap. The system should now be set up to operate as indicated in Figure 9. During oxidation of the condensate trap sample, monitor the NDIR to determine when all the sample has been removed and oxidized (indicated by return to baseline of NDIR analyzer output). Begin heating the condensate trap and probe with a propane torch. The trap should be heated to a temperature at which the trap glows a "dull red" (approximately 500°C). During the early part of the trap "burn out," adjust the carrier and auxiliary oxygen flow rates so that an excess of oxygen is being fed to the catalyst system. Gradually increase the flow of carrier gas through the trap. After the NDIR indicates that most of the organic matter has been purged, place the trap in a muffle furnance (500°C). Continue to heat the probe with a torch or some other procedure (e.g., electrical resistance heater). Continue this procedure for at least 5 minutes after the NDIR has returned to baseline. Remove the heat from the trap but continue the carrier flow until the intermediate collection vessel is pressurized to a gauge pressure of 800 mm Hg (nominal). When the vessel is pressurized, vent the carrier; measure and record the final intermediate collection vessel pressure (P_f) as well as the barometric pressure (P_{bv}), ambient temperature (T_v), and collection vessel volume (V_v).

4.4 Analysis. Prior to putting the NMO analyzer into routine operation, an initial performance test must be conducted. Start the analyzer and perform all the necessary functions in order to put the analyzer in proper working order, then conduct the performance test according to the procedures established in section 5.2. Once the performance test has been successfully completed and the CO_2 and NMO calibration response factors determined, proceed with sample analysis as follows:

4.4.1 Daily operations and calibration checks. Prior to and immediately following the analysis of each set of samples or on a daily basis (whichever occurs first) conduct a calibration test according to the procedures established in section 5.3. If the criteria of the daily calibration test cannot be met, repeat the NMO analyzer performance test (section 5.2) before proceeding.

4.4.2 Analysis of Recovered Condensate Sample. Purge the sample loop with sample and then inject a preliminary sample in order to determine the appropriate FID attenuation. Inject triplicate samples from the intermediate collection vessel and record the values obtained for the condensible organics as CO_2 (C_{cm}).

4.4.3 Analysis of Sample Tank. Purge the sample loop with sample and inject a preliminary sample in order to determine the appropriate FID attenuation for monitoring the backflushed non-methane organics. Inject triplicate samples from the sample tank and record the values obtained for the nonmethane organics (C_{tm}).

5. Calibration and Operational Checks

Maintain a record of performance of each item.

5.1 Initial Performance Check of Condensate Recovery and Conditioning Apparatus.

5.1.1 Carrier Gas and Auxiliary Oxygen Blank. Set equal flow rates for both the carrier gas and auxiliary oxygen. With the trap switching valves in the bypass position and the catalyst in-line, fill an evacuated intermediate collection vessel with carrier gas. Analyze the collection vessel for CO_2; the carrier blank is acceptable if the CO_2 concentration is less than 10 ppm.

5.1.2 Catalyst Efficiency Check. Set up the condensate trap recovery system so that the carrier flow bypasses the trap inlet and is vented to the atmosphere at the system outlet. Assure that the valves isolating the collection system from the atmospheric vent and vacuum pump are closed and then attach an evacuated intermediate collection vessel to the system. Connect the methane standard gas cyclinder (section 3.3.1) to the system's condensate trap connector (probe end, Figure 4). Adjust the system valving so that the standard gas cylinder acts as the carrier gas and adjust the flow rate to the rate normally used during trap sample recovery. Switch off the auxiliary oxygen flow and then switch from vent to collect in order to begin collecting a sample. Continue collecting a sample in a normal manner

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until the intermediate vessel is filled to a nominal gauge pressure of 300 mm Hg. Remove the intermediate vessel from the system and vent the carrier flow to the atmosphere. Switch the valving to return the system to its normal carrier gas and normal operating conditions. Analyze the collection vessel for CO_2; the catalyst efficiency is acceptable if the CO_2 concentration is within ±5 percent of the expected value.

5.1.3 System Performance Check. Construct a liquid sample injection unit similar in design to the unit shown in Figure 6. Insert this unit into the condensate recovery and conditioning system in place of a condensate trap and set the carrier gas and auxiliary oxygen flow rates to normal operating levels. Attach an evacuated intermediate collection vessel to the system and switch from system vent to collect. With the carrier gas routed through the injection unit and the oxidation catalyst, inject a liquid sample (see. 5.1.3.1 to 5.1.3.4) via the injection septum. Heat the injection unit with a torch while monitoring the oxidation reaction on the NDIR. Continue the purge until the reaction is complete. Measure the final collection vessel pressure and then analyze the vessel to determine the CO_2 concentration. For each injection, calculate the percent recovery using the equation in section 6.6.

The performance test is acceptable if the average percent recovery is 100 ± 10 percent with a relative standard deviation (section 6.7) of less than 5 percent for each set of triplicate injections as follows:

5.1.3.1 100 μl hexane.

5.1.3.2 10 μl hexane.

5.1.3.3 100 μl toluene.

5.1.3.4 10 μl toluene.

5.2 Initial NMO Analyzer Performance Test.

5.2.1 Oxidation Catalyst Efficiency Check. Turn off or bypass the NMO analyzer reduction catalyst. Make triplicate injections of the high level methane standard (section 3.3.1). The oxidation catalyst operation is acceptable if no FID response is noted.

5.2.2 Analyzer Linearity Check and NMO Calibration. Operating both the oxidation and reduction catalysts, conduct a linearity check of the analyzer using the propane standards specified in section 3.3. make triplicate injections of each calibration gas and then calculate the average response factor (area/ppm C) for each gas, as well as the overall mean of the response factor values. The instrument linearity is acceptable if the average response factor of each calibration gas is within ±5 percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than ±5 percent. Record the overall mean of the propane response factor values as the NMO calibration response factor (RF_{NMO}).

5.2.3 Reduction Catalyst Efficiency Check and CO_2 Calibration. An exact determination of the reduction catalyst efficiency is not required. Instead, proper catalyst operation is indirectly checked and continuously monitored by establishing a CO_2 response factor and comparing it to the NMO response factor. Operating both the oxidation and reduction catalysts make triplicate injections of each of the CO_2 calibration gases (section 3.3.3). Calculate the average response factor (area/ppm) for each calibration gas, as well as the overall mean of the response factor values. The reduction catalyst operation is acceptable if the average response factor of each calibration gas is within ±5 percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than ±5 percent. Additionally, the CO_2 overall mean response factor must be within ±10 percent of the NMO calibration response factor (RF_{NMO}) calculated in section 5.2.2. Record the overall mean of the response factor values as the CO_2 calibration response factor (RF_{CO_2}).

5.2.4 NMO System Blank. For the high level CO_2 calibration gas (section 3.3.3) record the NMO value measured during the CO_2 calibration conducted in section 5.2.3. This value is the NMO blank value for the analyzer (B_a) and should be less than 10 ppm.

5.2.5 System Performance Check. Check the column separation and overall performance of the analyzer by making triplicate injections of the calibration gases listed in section 3.3.4. The analyzer performance is acceptable if the measured NMO value for each gas (average of triplicate injections) is within ±12 percent of the expected value.

5.3 NMO Analyzer Daily Calibration.

5.3.1 NMO Blank and CO_2. Inject triplicate samples of the high level CO_2 calibration gas (section 3.3.3) and calculate the average response factor. The system operation is adequate if the calculated response factor is within ±10 percent of the RF_{CO_2} calculated during the initial performance test (section 5.2.2). Use the daily response factor (DRF_{CO_2}) for analyzer calibration and the calculation of measured CO_2 concentrations in the collection vessel samples. In addition, record the NMO blank value (B_a); this value should be less than 10 ppm.

5.3.2 NMO Calibration. Inject triplicate samples of the mixed propane calibration cylinder (section 3.3.4.1) and calculate the average NMO response factor. The system operation is adequate if the calculated response factor is within ±10 percent of the RF_{NMO} calculated during the initial performance test (section 5.2.1). Use the daily response factor (DRF_{NMO}) for analyzer calibra-

tion and calculation of NMO concentrations in the sample tanks.

5.4 Sample Tank. The volume of the gas sampling tanks used must be determined. Prior to putting each tank in service, determine the tank volume by weighing the tanks empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

5.5 Intermediate Collection Vessel. The volume of the intermediate collection vessels used to collect CO_2 during the analysis of the condensate traps must be determined. Prior to putting each vessel into service, determine the volume by weighing the vessel empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

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6. Calculations

Note: All equations are written using absolute pressure; absolute pressures are determined by adding the measured barometric pressure to the measured gauge pressure.

6.1 Sample Volume. For each test run, calculate the gas volume sampled:

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right)$$

6.2 Noncondensible Organics. For each sample tank, determine the concentration of nonmethane organics (ppm C):

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} \quad \frac{P_{t1}}{T_{t1}}} \right] \left[\frac{1}{r} \sum_{j=1}^{r} C_{tm_j} - B_a \right]$$

6.3 Condensible Organics. For each condensate trap determine the concentration of organics (ppm C):

$$C_c = 0.386 \frac{V_v}{V_s} \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

6.4 Total Gaseous Nonmethane Organics (TGNMO). To determine the TGNMO concentration for each test run, use the following equation:

$$C = C_t + C_c$$

6.5 Total Gaseous Nonmethane Organics (TGNMO) Mass Concentration. To determine the TGNMO mass concentration as carbon for each test run, use the following equation:

$$M_c = 0.498\ C$$

6.6 Percent Recovery. To calculate the percent recovery for the liquid injections to the condensate recovery and conditioning system use the following equation:

$$\text{percent recovery} = 1.6\ \frac{M}{L}\ \frac{V_v}{\rho}\ \frac{P_f}{T_f}\ \frac{C_{cm}}{N}$$

6.7 Relative Standard Deviation.

$$RSD = \frac{100}{\bar{X}} \sqrt{\frac{\Sigma\ (x_1 - \bar{x})^2}{n - 1}}$$

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Where:

B_a = Measured NMO blank value for NMO analyzer, ppm C.

B_t = Measured CO_2 blank value for condensate recovery and conditioning system carrier gas, ppm CO_2.

C = total gaseous nonmethane organic (TGNMO) concentration of the effluent, ppm C equivalent.

C_c = Calculated condensible organic (condensate trap) concentration of the effluent, ppm C equivalent.

C_{cm} = Measured concentration (NMO analyzer) for the condensate trap (intermediate collection vessel), ppm CO_2.

C_t = Calculated noncondensible organic concentration (sample tank) of the effluent, ppm C equivalent.

C_{tm} = Measured concentration (NMO analyzer) for the sample tank, ppm NMO.

L = Volume of liquid injected, microliters.

M = Molecular weight of the liquid injected, g/g-mole.

M_c = total gaseous non-methane organic (TGNMO) mass concentration of the effluent, mg C/dscm.

N = Carbon number of the liquid compound injected (N=7 for toluene, N=6 for hexane).

P_f = Final pressure of the intermediate collection vessel, mm Hg absolute.

P_{ti} = Gas sample tank pressure prior to sampling, mm Hg absolute.

P_t = Gas sample tank pressure after sampling, but prior to pressurizing, mm Hg absolute.

P_{tf} = Final gas sample tank pressure after pressurizing, mm Hg absolute.

T_f = Final temperature of intermediate collection vessel, °K.

T_{ti} = Sample tank temperature prior to sampling, °K.

T_t = Sample tank temperature at completion of sampling, °K.

T_{tf} = Sample tank temperature after pressurizing °K.

V = Sample tank volume, cm.

V_v = Intermediate collection vessel volume, cm.

V_s = Gas volume sampled, dscm.

n = Number of data points.

q = Total number of analyzer injections of intermediate collection vessel during analysis (where k = injection number, 1 . . . q).

r = Total number of analyzer injections of sample tank during analysis (where j = injection number, 1 . . . r).

x_i = Individual measurements.

X = Mean value.

p = Density of liquid injected, g/cc.

7. *Bibliography*

7.1 Salo, Albert E., Samuel Witz, and Robert D. MacPhee. Determination of Solvent Vapor Concentrations by Total Combustion Analysis: A Comparison of Infrared with Flame Ionization Detectors. Paper No. 75-33.2 (Presented at the 68th Annual Meeting of the Air Pollution Control Association. Boston, MA. June 15-20, 1975.) 14 p.

7.2 Salo, Albert E., William L. Oaks, and Robert D. MacPhee. Measuring the Organic Carbon Content of Source Emissions for Air Pollution Control. Paper No. 74-190. (Presented at the 67th Annual Meeting of the Air Pollution Control Association. Denver, CO. June 9-13, 1974.) 25 p.

Method 25—Addendum I. System Components

In test Method 25 several important system components are not specified; instead minimum performance specifications are provided. The method is written in this manner to permit individual preference in choosing components, as well as to encourage development and use of improved components. This addendum is added to the method in order to provide users with some specific information regarding components which have been found satisfactory for use with the method. This listing is given only for the purpose of providing information and does not constitute an endorsement of any product by the Environmental Protection Agency. This list is not meant to imply that other components not listed are not acceptable.

1. Condensate Recovery and Conditioning System Oxidation Catalyst. ⅜" OD×14" inconel tubing packed with 8 inches of hopcalite* oxidizing catalyst and operated at 800°C in a tube furnace.

Note: At this temperature, this catalyst must be purged with carrier gas at all times to prevent catalyst damage.

2. NMO Analyzer Oxidation Catalyst. ¼" OD×14" inconel tubing packed with 6 inches of hopcalite oxidizing catalyst and operated at 800°C in a tube furnace. (See note above.)

3. NMO Analyzer Reduction Catalyst. Reduction Catalyst Module; Byron Instruments, Raleigh, N.C.

4. Gas Chromatographic Separation Column. ⅛ inch OD stainless steel packed with 3 feet of 10 percent methyl silicone, Sp 2100 (or equivalent) on Supelcoport (or equivalent), 80/100 mesh, followed by 1.5 feet Porapak Q (or equivalent) 60/80 mesh. The inlet side is to the silicone. Condition the column for 24 hours at 200°C with 20 cc/min N_2 purge.

During analysis for the nonmethane organics the separation column is operated as follows: First, operate the column at −78°C (dry ice bath) to elute CO and CH_4. After

*MSA registered trademark.

the CH_4 peak operate the column at 0°C to elute CO_2. When the CO_2 is completely eluted, switch the carrier flow to backflush the column and simultaneously raise the column temperature to 100°C in order to elute all nonmethane organics (exact timings for column operation are determined from the calibration standard).

NOTE: The dry ice operating condition may be deleted if separation of CO and CH_4 is unimportant.

NOTE: Ethane and ethylene may or may not be measured using this column; whether or not ethane and ethylene are quantified will depend on the CO_2 concentration in the gas sample. When high levels of CO_2 are present, ethane and ethylene will elute under the tail of the CO_2 peak.

5. Carrier Gas. Zero grade nitrogen or helium or zero air.

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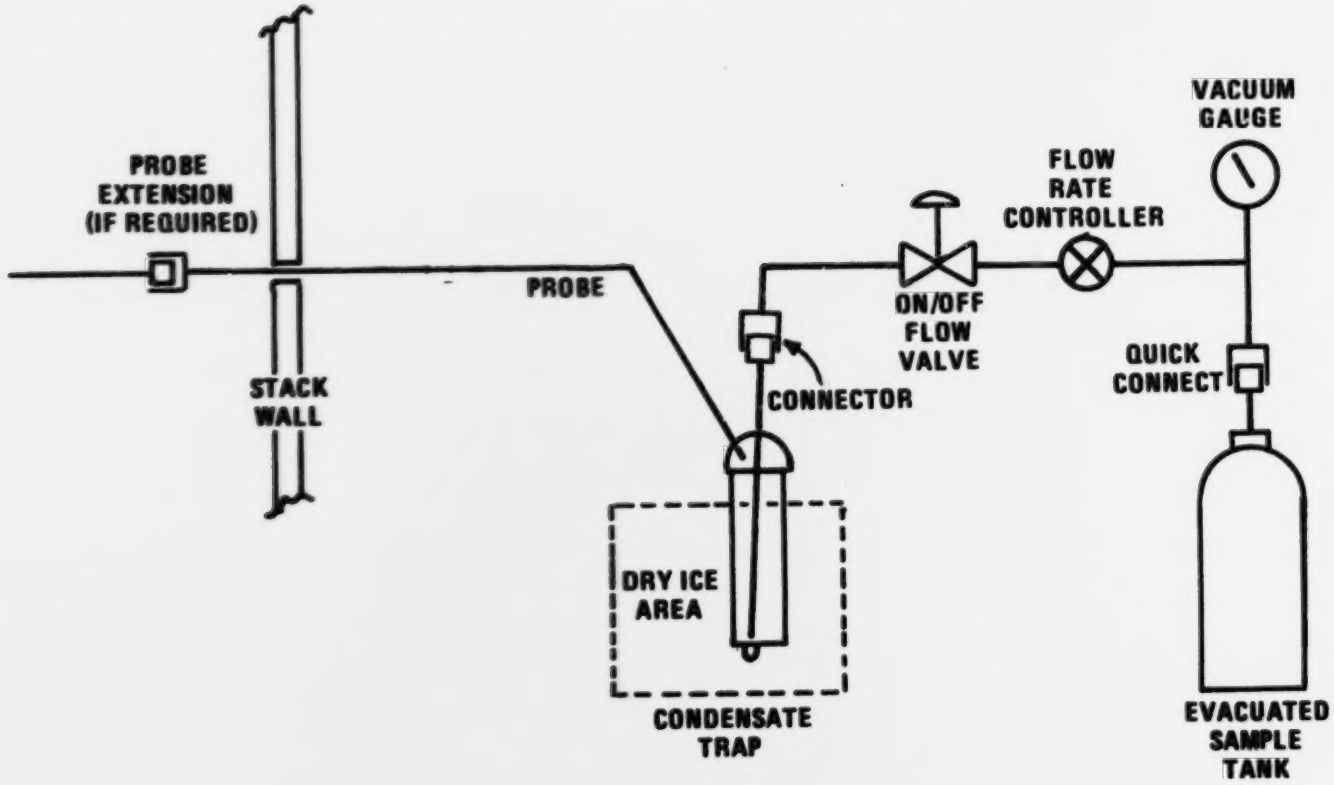

Figure 1. Sampling apparatus.

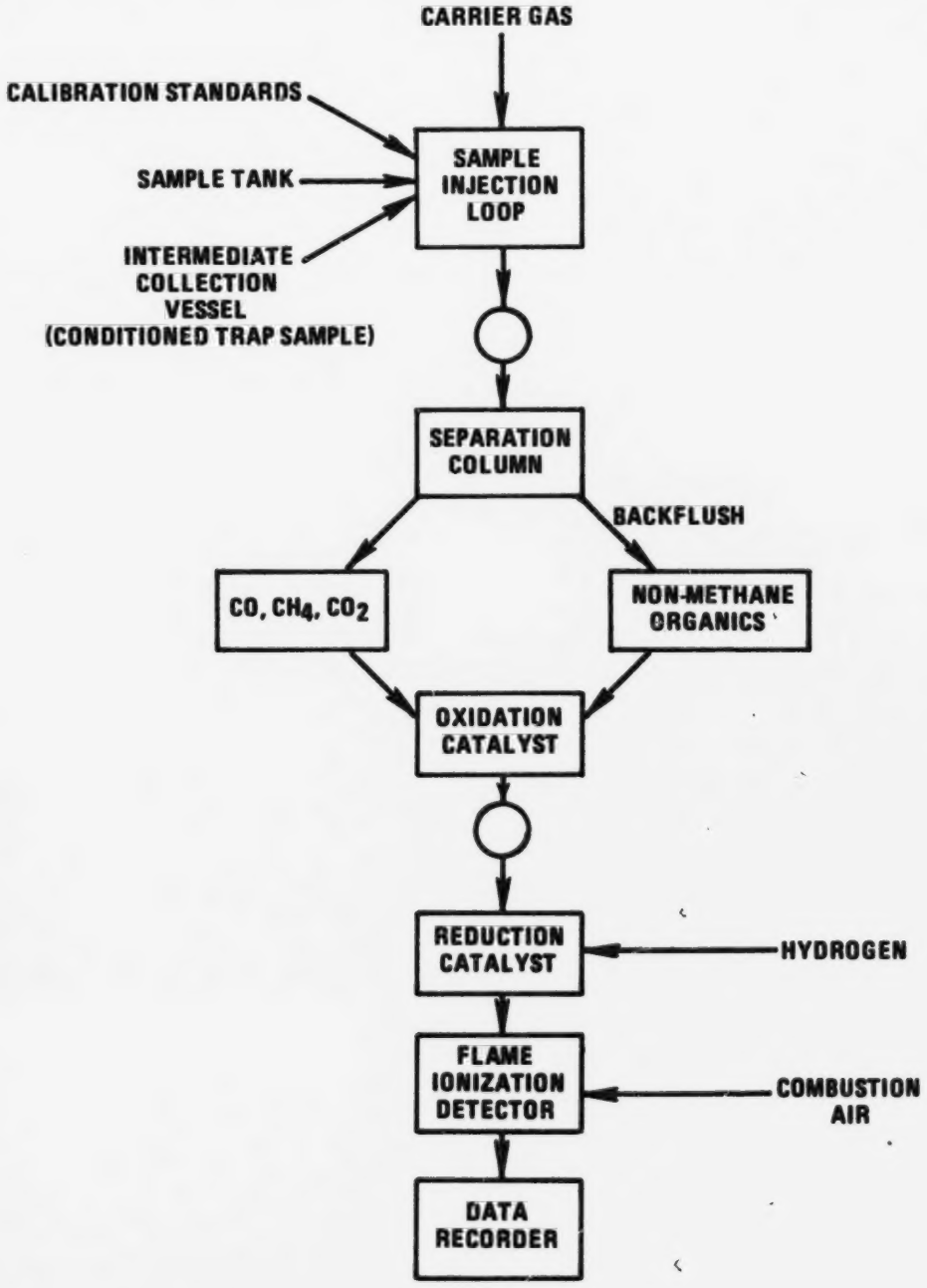

Figure 2. Simplified schematic of non-methane organic (NMO) analyzer.

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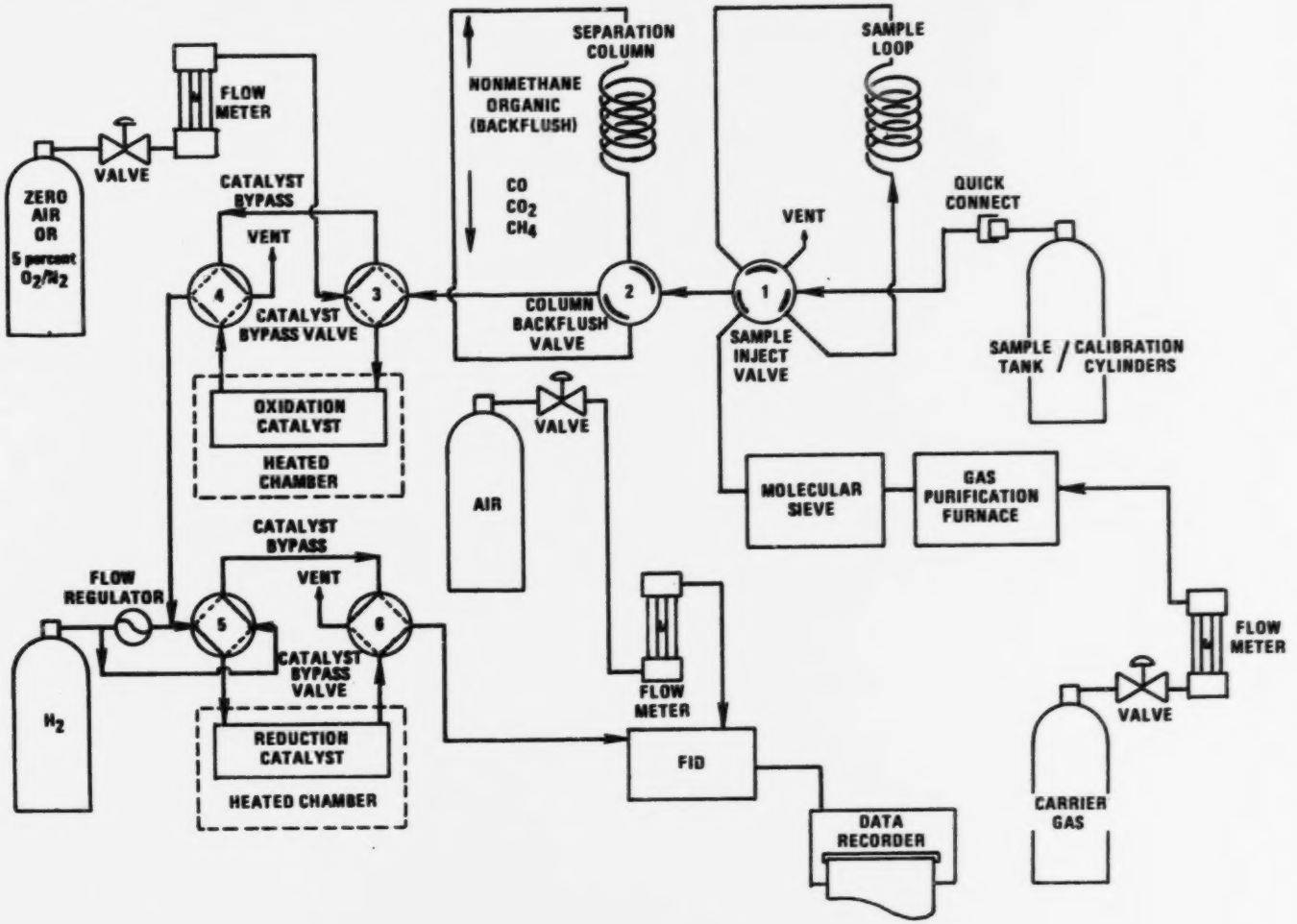

Figure 3. Nonmethane organic (NMO) analyzer.

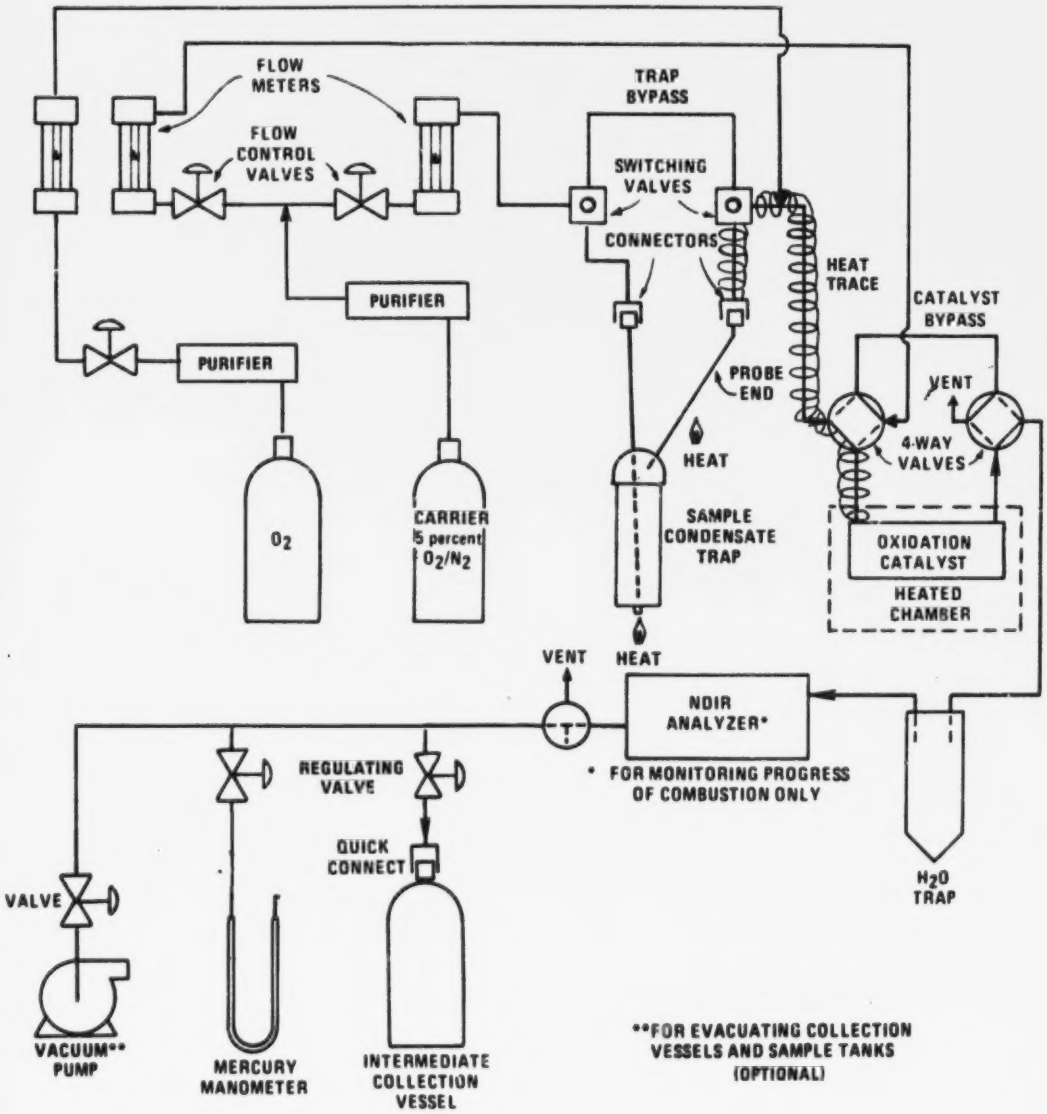

Figure 4. Condensate recovery and conditioning apparatus.

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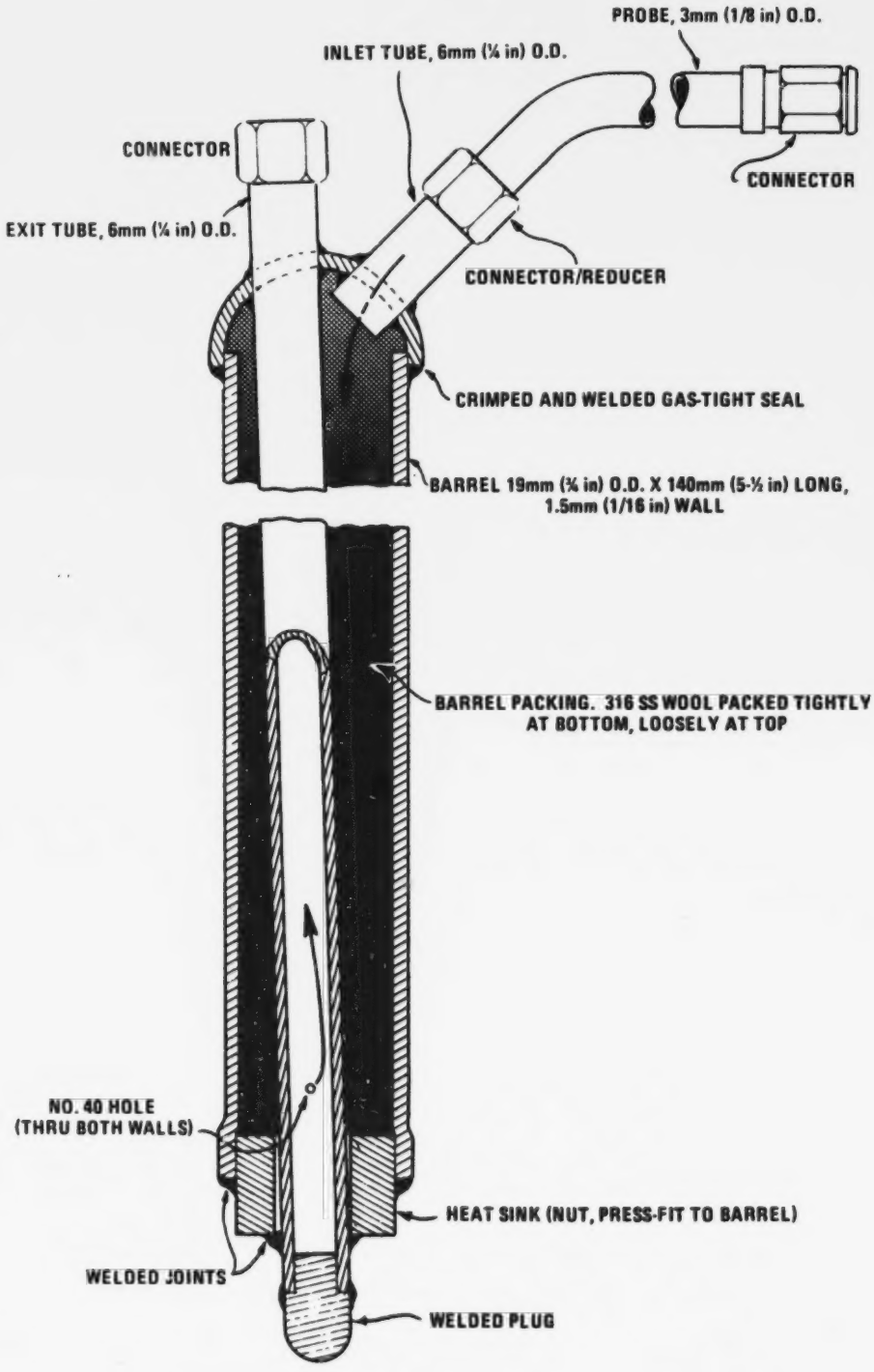
PROBE, 3mm (1/8 in) O.D.
INLET TUBE, 6mm (¼ in) O.D.
CONNECTOR
CONNECTOR
EXIT TUBE, 6mm (¼ in) O.D.
CONNECTOR/REDUCER
CRIMPED AND WELDED GAS-TIGHT SEAL
BARREL 19mm (¾ in) O.D. X 140mm (5-½ in) LONG, 1.5mm (1/16 in) WALL
BARREL PACKING. 316 SS WOOL PACKED TIGHTLY AT BOTTOM, LOOSELY AT TOP
NO. 40 HOLE (THRU BOTH WALLS)
HEAT SINK (NUT, PRESS-FIT TO BARREL)
WELDED JOINTS
WELDED PLUG
MATERIAL: TYPE 316 STAINLESS STEEL

Figure 5. Condensate trap[2].

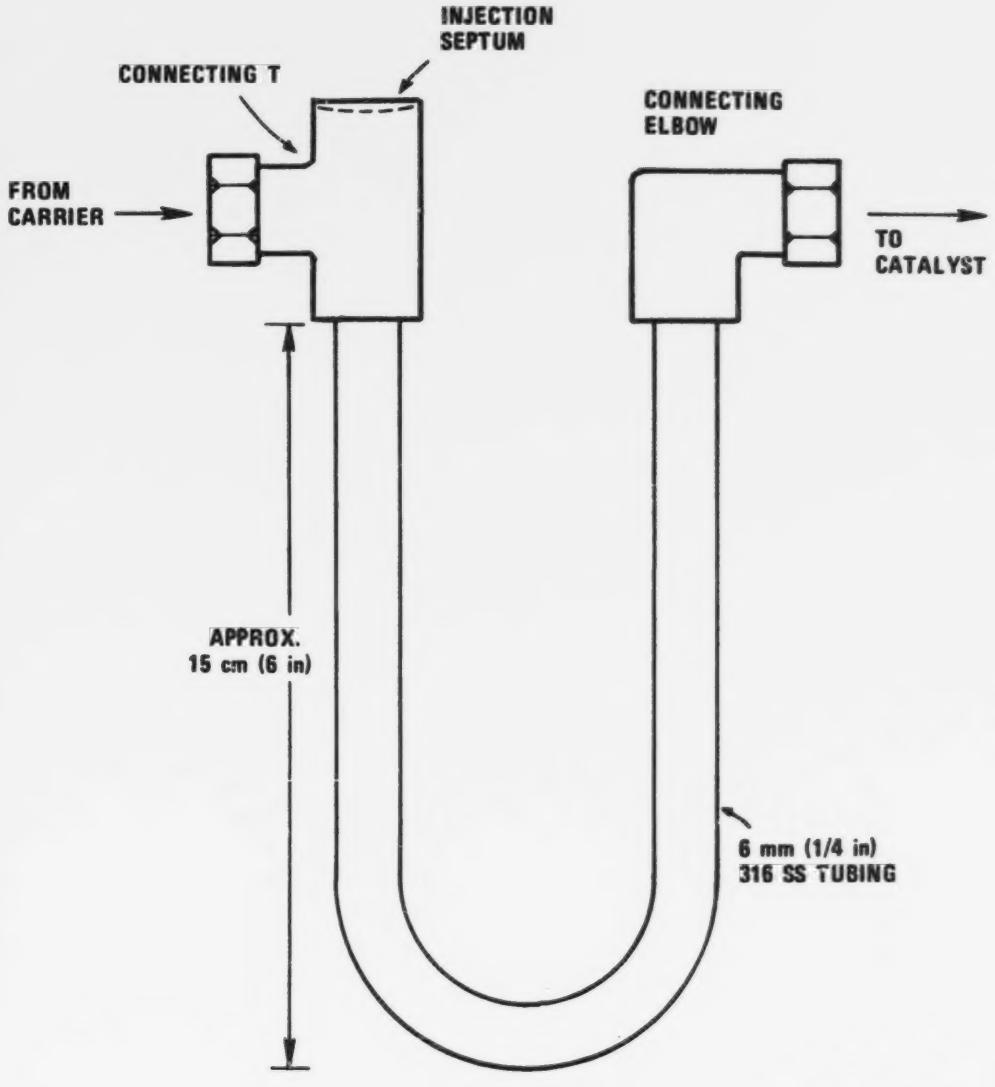

Figure 6. Liquid sample injection unit.

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VOLATILE ORGANIC CARBON

FACILITY_____ SAMPLE LOCATION_____

LOCATION_____ OPERATOR_____

DATE_____ RUN NUMBER_____

TANK NUMBER_____ TRAP NUMBER_____ SAMPLE ID NUMBER_____

	TANK VACUUM, mm Hg	cm Hg	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER)		(GAUGE)		
POST TEST (MANOMETER)		(GAUGE)		

LEAK RATE cm Hg / 10 min

PRETEST_____

POST TEST_____

TIME CLOCK/SAMPLE	GAUGE VACUUM, cm Hg	FLOWMETER SETTING	COMMENTS

Figure 7. Example Field Data Form.

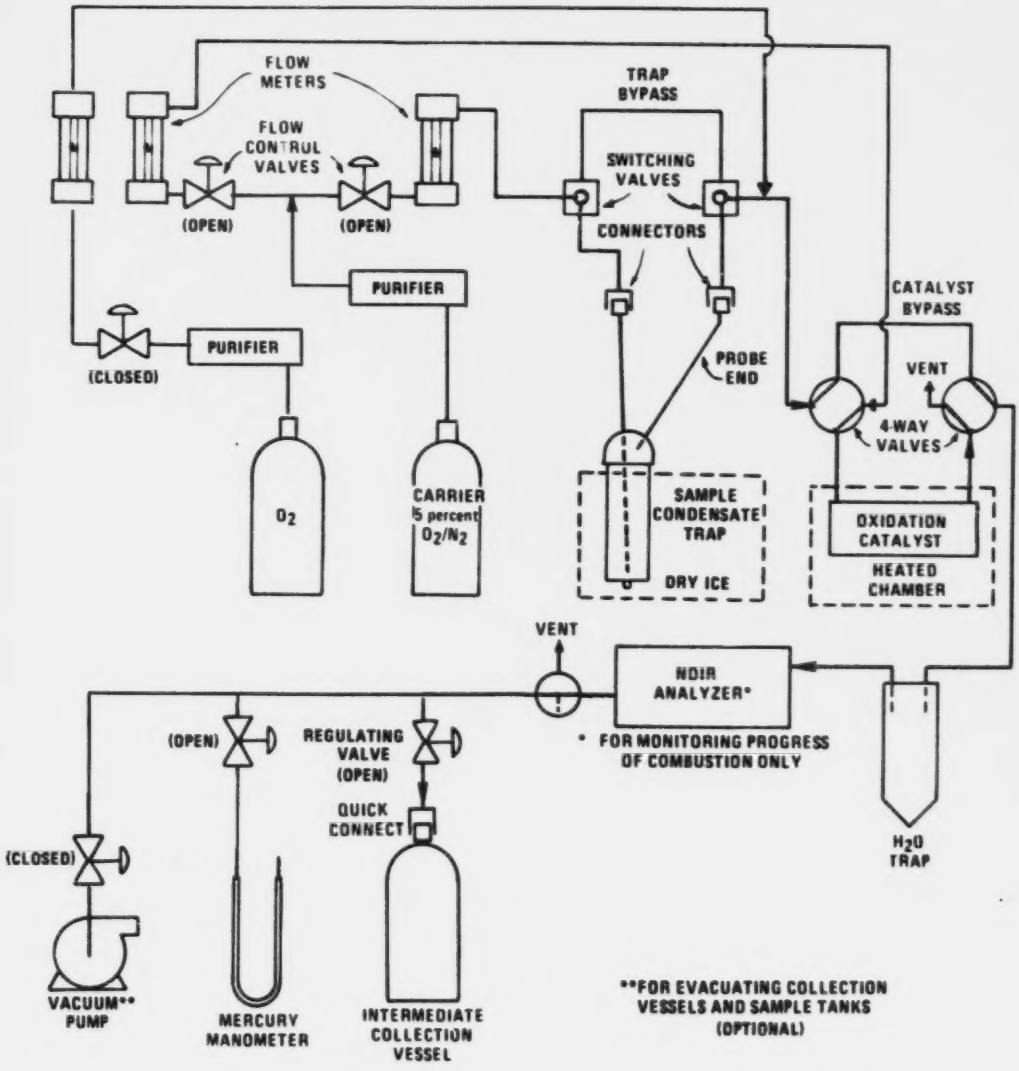

Figure 8. Condensate recovery and conditioning apparatus, carbon dioxide purge.

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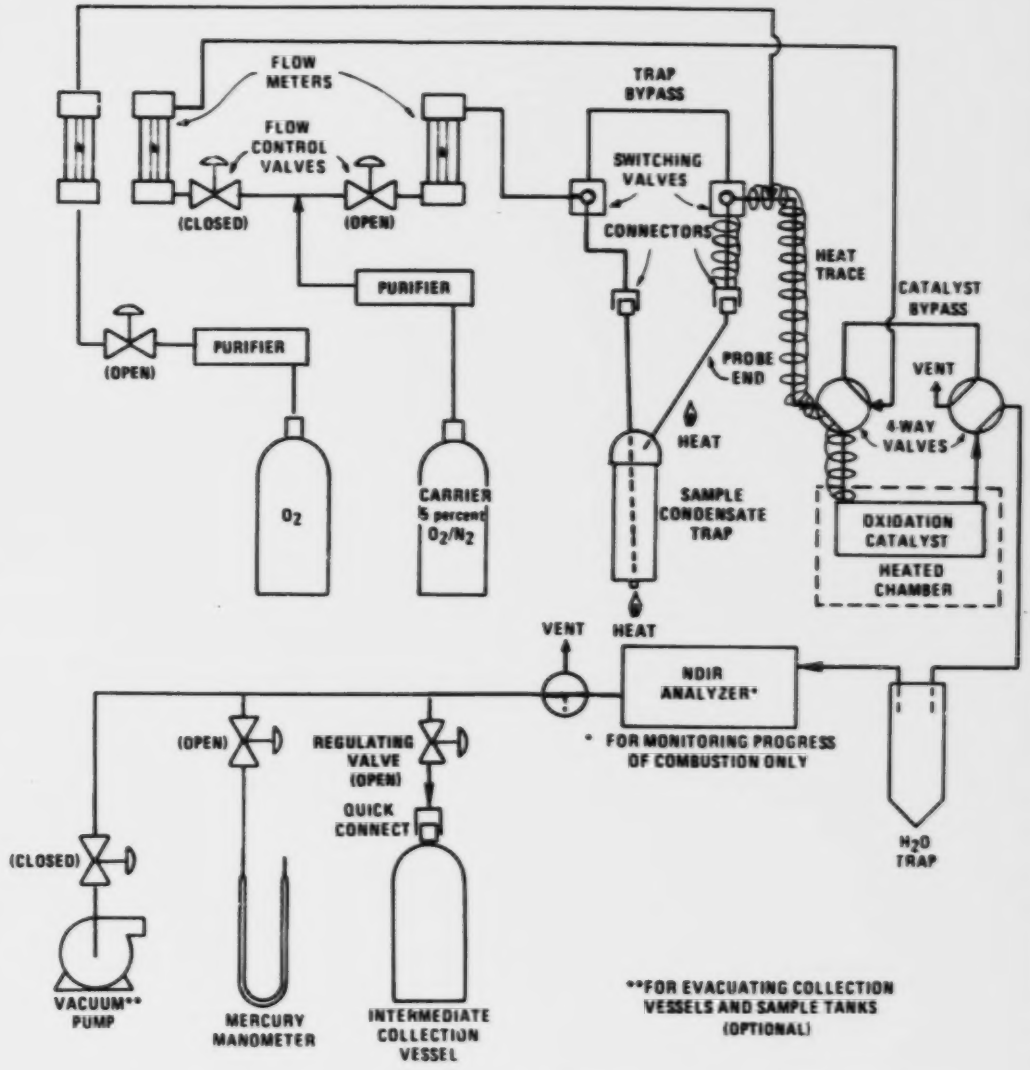

Figure 9. Condensate recovery and conditioning apparatus, collection of trap organics.

(Secs. 111, 114, 301(a), Clean Air Act as amended (42 U.S.C. 7411, 7414, 7601))

[36 FR 24877, Dec. 23, 1971, as amended at 38 FR 13562, May 23, 1973; 39 FR 9319, Mar. 8, 1974; 39 FR 13776, Apr. 17, 1974; 39 FR 20794, June 14, 1974; 39 FR 39874, Nov. 12, 1974; 40 FR 33157, Aug. 6, 1975; 41 FR 3828, Jan. 26, 1976; 41 FR 52299, Nov. 29, 1976; 42 FR 41755, Aug. 18, 1977; 43 FR 1495, Jan. 10, 1978; 43 FR 7575, Feb. 23, 1978; 43 FR 10870, Mar. 15, 1978; 43 FR 11984, Mar. 23, 1978; 43 FR 34785, Aug. 8, 1978; 44 FR 2579, Jan. 12, 1979; 44 FR 33619, June 11, 1979; 44 FR 52801, Sept. 10, 1979; 45 FR 41852, June 20, 1980; 45 FR 44208, June 30, 1980; 45 FR 65958, Oct. 3, 1980; 45 FR 66752, Oct. 7, 1980; 45 FR 85016, Dec. 24, 1980; 46 FR 53148, Oct. 28, 1981; 47 FR 16574, Apr. 16, 1982; 47 FR 28624, July 1, 1982]

Appendix B—Performance Specifications

Performance Specification 1—Performance Specifications and Specification Test Procedures for Transmissometer Systems for Continuous Measurement of the Opacity of Stack Emissions

1. Principle and Applicability.

1.1 Principle. The opacity of particulate matter in stack emissions is measured by a continuously operating emission measurement system. These systems are based upon the principle of transmissometry which is a direct measurement of the attenuation of visible radiation (opacity) by particulate matter in a stack effluent. Light having specific spectral characteristics is projected from a lamp across the stack of a pollutant source to a light sensor. The light is attenuated due to absorption and scatter by the particulate matter in the effluent. The percentage of visible light attenuated is defined as the opacity of the emission. Transparent stack emissions that do not attenuate light will have a transmittance of 100 or an opacity of 0. Opaque stack emissions that attenuate all of the visible light will have a transmittance of 0 or an opacity of 100 percent. The transmissometer is evaluated by use of neutral density filters to determine the precision of the continuous monitoring system. Tests of the system are performed to determine zero drift, calibration drift, and response time characteristics of the system.

1.2 Applicability. This performance specification is applicable to the continuous monitoring systems specified in the subparts for measuring opacity of emissions. Specifications for continuous measurement of visible emissions are given in terms of design, performance, and installation parameters. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems subject to approval by the Administrator.

2. Apparatus.

2.1 Calibrated Filters. Optical filters with neutral spectral characteristics and known optical densities to visible light or screens known to produce specified optical densities. Calibrated filters with accuracies certified by the manufacturer to within ±3 percent opacity shall be used. Filters required are low, mid, and high-range filters with nominal optical densities as follows when the transmissometer is spanned at opacity levels specified by applicable subparts:

Span value (percent opacity)	Calibrated filter optical densities with equivalent opacity in parentheses		
	Low-range	Mid-range	High-range
50	0.1 (20)	0.2 (37)	0.3 (50)
60	.1 (20)	.2 (37)	.3 (50)
70	.1 (20)	.3 (50)	.4 (60)
80	.1 (20)	.3 (50)	.6 (75)
90	.1 (20)	.4 (60)	.7 (80)
100	.1 (20)	.4 (60)	.9 (87.5)

It is recommended that filter calibrations be checked with a well-collimated photopic transmissometer of known linearity prior to use. The filters shall be of sufficient size to attenuate the entire light beam of the transmissometer.

2.2 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with the analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

2.3 Opacity measurement System. An in-stack transmissometer (folded or single path) with the optical design specifications designated below, associated control units and apparatus to keep optical surfaces clean.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of pollutant opacity in a source effluent. Continuous monitoring systems consist of major subsystems as follows:

3.1.1 Sampling Interface. The portion of a continuous monitoring system for opacity that protects the analyzer from the effluent.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant and generates a signal output that is a function of the pollutant opacity.

3.1.3 Data Recorder. That portion of the continuous monitoring system that processes the analyzer output and provides a per-

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manent record of the output signal in terms of pollutant opacity.

3.2 Transmissometer. The portions of a continuous monitoring system for opacity that include the sampling interface and the analyzer.

3.3 Span. The value of opacity at which the continuous monitoring system is set to produce the maximum data display output. The span shall be set at an opacity specified in each applicable subpart.

3.4 Calibration Error. The difference between the opacity reading indicated by the continuous monitoring system and the known values of a series of test standards. For this method the test standards are a series of calibrated optical filters or screens.

3.5 Zero Drift. The change in continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time of the measurements is zero.

3.6 Calibration Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time of the measurements is the same known upscale value.

3.7 System Response. The time interval from a step change in opacity in the stack at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is reached as displayed on the continuous monitoring system data recorder.

3.8 Operational Test Period. A minimum period of time over which a continuous monitoring system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.9 Transmittance. The fraction of incident light that is transmitted through an optical medium of interest.

3.10 Opacity. The fraction of incident light that is attenuated by an optical medium of interest. Opacity (O) and transmittance (T) are related as follows:

$$O=1-T$$

3.11 Optical Density. A logarithmic measure of the amount of light that it attenuated by an optical medium of interest. Optical density (D) is related to the transmittance and opacity as follows:

$$D=-\log_{10}T$$
$$D=-\log_{10}(1-O)$$

3.12 Peak Optical Response. The wavelength of maximum sensitivity of the instrument.

3.13 Mean Spectral Response. The wavelength which bisects the total area under the curve obtained pursuant to paragraph 9.2.1.

3.14 Angle of View. The maximum (total) angle of radiation detection by the photodetector assembly of the analyzer.

3.15 Angle of Projection. The maximum (total) angle that contains 95 percent of the radiation projected from the lamp assembly of the analyzer.

3.16 Pathlength. The depth of effluent in the light beam between the receiver and the transmitter of the single-pass transmissometer, or the depth of effluent between the transceiver and reflector of a double-pass transmissometer. Two pathlengths are referenced by this specification:

3.16.1 Monitor Pathlength. The depth of effluent at the installed location of the continuous monitoring system.

3.16.2 Emission Outlet Pathlength. The depth of effluent at the location emissions are released to the atmosphere.

4. Installation Specification.

4.1 Location. The transmissometer must be located across a section of duct or stack that will provide a particulate matter flow through the optical volume of the transmissometer that is representative of the particulate matter flow through the duct or stack. It is recommended that the monitor pathlength or depth of effluent for the transmissometer include the entire diameter of the duct or stack. In installations using a shorter pathlength, extra caution must be used in determining the measurement location representative of the particulate matter flow through the duct or stack.

4.1.1 The transmissometer location shall be downstream from all particulate control equipment.

4.1.2 The transmissometer shall be located as far from bends and obstructions as practical.

4.1.3 A transmissometer that is located in the duct or stack following a bend shall be installed in the plane defined by the bend where possible.

4.1.4 The transmissometer should be installed in an accessible location.

4.1.5 When required by the Administrator, the owner or operator of a source must demonstrate that the transmissometer is located in a section of duct or stack where a representative particulate matter distribution exists. The determination shall be accomplished by examining the opacity profile of the effluent at a series of positions across the duct or stack while the plant is in operation at maximum or reduced operating rates or by other tests acceptable to the Administrator.

4.2 Slotted Tube. Installations that require the use of a slotted tube shall use a slotted tube of sufficient size and blackness so as not to interfere with the free flow of effluent through the entire optical volume of the transmissometer or reflect light into the transmissometer photodetector. Light

reflections may be prevented by using blackened baffles within the slotted tube to prevent the lamp radiation from impinging upon the tube walls, by restricting the angle of projection of the light and the angle of view of the photodetector assembly to less than the cross-sectional area of the slotted tube, or by other methods. The owner or operator must show that the manufacturer of the monitoring system has used appropriate methods to minimize light reflections for systems using slotted tubes.

4.3 Data Recorder Output. The continuous monitoring system output shall permit expanded display of the span opacity on a standard 0 to 100 percent scale. Since all opacity standards are based on the opacity of the effluent exhausted to the atmosphere, the system output shall be based upon the emission outlet pathlength and permanently recorded. For affected facilities whose monitor pathlength is different from the facility's emission outlet pathlength, a graph shall be provided with the installation to show the relationships between the continuous monitoring system recorded opacity based upon the emission outlet pathlength and the opacity of the effluent at the analyzer location (monitor pathlength). Tests for measurement of opacity that are required by this performance specification are based upon the monitor pathlength. The graph necessary to convert the data recorder output to the monitor pathlength basis shall be established as follows:

$$\log (1-0_1)=(1_1/1_2) \log (1-0_2)$$

where:

0_1 = the opacity of the effluent based upon 1_1.
0_2 = the opacity of the effluent based upon 1_2.
1_1 = the emission outlet pathlength.
1_2 = the monitor pathlength.

5. Optical Design Specifications.

The optical design specifications set forth in Section 6.1 shall be met in order for a measurement system to comply with the requirements of this method.

6. Determination of Conformance with Design Specifications.

6.1 The continuous monitoring system for measurement of opacity shall be demonstrated to conform to the design specifications set forth as follows:

6.1.1 Peak Spectral Response. The peak spectral response of the continuous monitoring systems shall occur between 500 nm and 600 nm. Response at any wavelength below 400 nm or above 700 nm shall be less than 10 percent of the peak response of the continuous monitoring system.

6.1.2 Mean Spectral Response. The mean spectral response of the continuous monitoring system shall occur between 500 nm and 600 nm.

6.1.3 Angle of View. The total angle of view shall be no greater than 5 degrees.

6.1.4 Angle of Projection. The total angle of projection shall be no greater than 5 degrees.

6.2 Conformance with the requirements of section 6.1 may be demonstrated by the owner or operator of the affected facility by testing each analyzer or by obtaining a certificate of conformance from the instrument manufacturer. The certificate must certify that at least one analyzer from each month's production was tested and satisfactorily met all applicable requirements. The certificate must state that the first analyzer randomly sampled met all requirements of paragraph 6 of this specification. If any of the requirements were not met, the certificate must show that the entire month's analyzer production was resampled according to the military standard 105D sampling procedure (MIL-STD-105D) inspection level II; was retested for each of the applicable requirements under paragraph 6 of this specification; and was determined to be acceptable under MIL-STD-105D procedures. The certificate of conformance must show the results of each test performed for the analyzers sampled during the month the analyzer being installed was produced. 6.3 The general test procedures to be followed to demonstrate conformance with Section 6 requirements are given as follows: (These procedures will not be applicable to all designs and will require modification in some cases. Where analyzer and optical design is certified by the manufacturer to conform with the angle of view or angle of projection specifications, the respective procedures may be omitted.)

6.3.1 Spectral Response. Obtain spectral data for detector, lamp, and filter components used in the measurement system from their respective manufacturers.

6.3.2 Angle of View. Set the receiver up as specified by the manufacturer. Draw an arc with radius of 3 meters. Measure the receiver response to a small (less than 3 centimeters) non-directional light source at 5-centimeter intervals on the arc for 26 centimeters on either side of the detector centerline. Repeat the test in the vertical direction.

6.3.3 Angle of Projection. Set the projector up as specified by the manufacturer. Draw an arc with radius of 3 meters. Using a small photoelectric light detector (less than 3 centimeters), measure the light intensity at 5-centimeter intervals on the arc for 26 centimeters on either side of the light source centerline of projection. Repeat the test in the vertical direction.

7. Continuous Monitoring System Performance Specifications.

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The continuous monitoring system shall meet the performance specifications in Table 1-1 to be considered acceptable under this method.

TABLE 1-1—PERFORMANCE SPECIFICATIONS

Parameter	Specifications
a. Calibration error	<pct opacity.[1]
b. Zero drift (24h)	<pct opacity.[1]
c. Calibration drift (24 h)	<pct opacity.[1]
d. Response time	10 s (maximum).
e. Operational test period	168 h.

[1]Expressed as sum of absolute mean value and the 95 pct confidence interval of a series of tests.

8. Performance Specification Test Procedures. The following test procedures shall be used to determine conformance with the requirements of paragraph 7:

8.1 Calibration Error and Response Time Test. These tests are to be performed prior to installation of the system on the stack and may be performed at the affected facility or at other locations provided that proper notification is given. Set up and calibrate the measurement system as specified by the manufacturer's written instructions for the monitor pathlength to be used in the installation. Span the analyzer as specified in applicable subparts.

8.1.1 Calibration Error Test. Insert a series of calibration filters in the transmissometer path at the midpoint. A minimum of three calibration filters (low, mid, and high-range) selected in accordance with the table under paragraph 2.1 and calibrated within 3 percent must be used. Make a total of five nonconsecutive readings for each filter. Record the measurement system output readings in percent opacity. (See Figure 1-1.)

8.1.2 System Response Test. Insert the high-range filter in the transmissometer path five times and record the time required for the system to respond to 95 percent of final zero and high-range filter values. (See Figure 1-2.)

8.2 Field Test for Zero Drift and Calibration Drift. Install the continuous monitoring system on the affected facility and perform the following alignments:

8.2.1 Preliminary Alignments. As soon as possible after installation and once a year thereafter when the facility is not in operation, perform the following optical and zero alignments:

8.2.1.1 Optical Alignment. Align the light beam from the transmissometer upon the optical surfaces located across the effluent (i.e., the retroflector or photodetector as applicable) in accordance with the manufacturer's instructions.

8.2.1.2 Zero Alignment. After the transmissometer has been optically aligned and the transmissometer mounting is mechanically stable (i.e., no movement of the mounting due to thermal contraction of the stack, duct, etc.) and a clean stack condition has been determined by a steady zero opacity condition, perform the zero alignment. This alignment is performed by balancing the continuous monitor system response so that any simulated zero check coincides with an actual zero check performed across the monitor pathlength of the clean stack.

8.2.1.3 Span. Span the continuous monitoring system at the opacity specified in subparts and offset the zero setting at least 10 percent of span so that negative drift can be quantified.

8.2.2. Final Alignments. After the preliminary alignments have been completed and the affected facility has been started up and reaches normal operating temperature, recheck the optical alignment in accordance with 8.2.1.1 of this specification. If the alignment has shifted, realign the optics, record any detectable shift in the opacity measured by the system that can be attributed to the optical realignment, and notify the Administrator. This condition may not be objectionable if the affected facility operates within a fairly constant and adequately narrow range of operating temperatures that does not produce significant shifts in optical alignment during normal operation of the facility. Under circumstances where the facility operations produce fluctuations in the effluent gas temperature that result in significant misalignments, the Administrator may require improved mounting structures or another location for installation of the transmissometer.

8.2.3 Conditioning Period. After completing the post-startup alignments, operate the system for an initial 168-hour conditioning period in a normal operational manner.

8.2.4 Operational Test Period. After completing the conditioning period, operate the system for an additional 168-hour period retaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed or calibrated. At 24-hour intervals the zero and span shall be checked according to the manufacturer's instructions. Minimum procedures used shall provide a system check of the analyzer internal mirrors and all electronic circuitry including the lamp and photodetector assembly and shall include a procedure for producing a simulated zero opacity condition and a simulated upscale (span) opacity condition as viewed by the receiver. The manufacturer's written instructions may be used providing that they equal or exceed these minimum procedures. Zero and span the transmissometer, clean all optical surfaces exposed to the effluent, realign optics, and make any necessary adjustments to the calibration of the system daily. These zero and calibration adjustments and optical rea-

lignments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the measurement system without operator intervention are allowable at any time. The magnitude of any zero or span drift adjustments shall be recorded. During this 168-hour operational test period, record the following at 24-hour intervals: (a) the zero reading and span readings after the system is calibrated (these readings should be set at the same value at the beginning of each 24-hour period); (b) the zero reading after each 24 hours of operation, but before cleaning and adjustment; and (c) the span reading after cleaning and zero adjustment, but before span adjustment. (See Figure 1-3.)

9. Calculation, Data Analysis, and Reporting.

9.1 Procedure for Determination of Mean Values and Confidence Intervals.

9.1.1 The mean value of the data set is calculated according to equation 1-1.

$$\bar{x}=\frac{1}{n}\sum_{i=1}^{n}x_i \qquad \text{Equation 1-1}$$

where:

x_i = absolute value of the individual measurements,

Σ = sum of the individual values.

$\bar{x}$ = mean value, and

n = number of data points.

9.1.2 The 95 percent confidence interval (two-sided) is calculated according to equation 1-2:

$$C.I._{95}=\frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\Sigma x_i^2)-(\Sigma x_i)^2} \qquad \text{Equation 1-2}$$

where:

Σx_i = sum of all data points, $t_{.975}=t_{1-\alpha/2}$, and

$C.I._{95}$ = 95 percent confidence interval estimate of the average mean value.

VALUES FOR $t_{.975}$

n	$t_{.975}$	n	$t_{.975}$
2	12.706	10	2.262
3	4.303	11	2.228
4	3.182	12	2.201
5	2.776	13	2.179
6	2.571	14	2.160
7	2.447	15	2.145
8	2.365	16	2.131
9	2.306		

The values in this table are already corrected for n-1 degrees of freedom. Use in equal to the number of samples as data points.

9.2 Data Analysis and Reporting.

9.2.1 Spectral Response. Combine the spectral data obtained in accordance with paragraph 6.3.1 to develop the effective spectral response curve of the transmissometer. Report the wavelength at which the peak response occurs, the wavelength at which the mean response occurs, and the maximum response at any wavelength below 400 nm and above 700 nm expressed as a percentage of the peak response as required under paragraph 6.2.

9.2.2 Angle of View. Using the data obtained in accordance with paragraph 6.3.2, calculate the response of the receiver as a function of viewing angle in the horizontal and vertical directions (26 centimeters of arc with a radius of 3 meters equal 5 degrees). Report relative angle of view curves as required under paragraph 6.2.

9.2.3 Angle of Projection. Using the data obtained in accordance with paragraph 6.3.3, calculate the response of the photoelectric detector as a function of projection angle in the horizontal and vertical directions. Report relative angle of projection curves as required under paragraph 6.2.

9.2.4 Calibration Error. Using the data from paragraph 8.1 (Figure 1-1), subtract the known filter opacity value from the value shown by the measurement system for each of the 15 readings. Calculate the mean and 95 percent confidence interval of the five different values at each test filter value according to equations 1-1 and 1-2. Report the sum of the absolute mean difference and the 95 percent confidence interval for each of the three test filters.

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Calibrated Neutral Density Filter Data
(See paragraph 8.1.1)

Low Range ___% opacity
Span Value ____% opacity
Mid Range ___% opacity
High Range ___% opacity

Date of Test _____ Location of Test _____

Calibrated Filter[1]	Analyzer Reading % Opacity	Differences[2] % Opacity
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

	Low	Mid	High
Mean difference	___	___	___
Confidence interval	___	___	___
Calibration error = Mean Difference[3] + C.I.	___	___	___

[1]Low, mid or high range
[2]Calibration filter opacity - analyzer reading
[3]Absolute value

Figure 1-1. Calibration Error Test

9.2.5 Zero Drift. Using the zero opacity values measured every 24 hours during the field test (paragraph 8.2), calculate the differences between the zero point after cleaning, aligning, and adjustment, and the zero value 24 hours later just prior to cleaning, aligning, and adjustment. Calculate the mean value of these points and the confidence interval using equations 1-1 and 1-2. Report the sum of the absolute mean value and the 95 percent confidence interval.

9.2.6 Calibration Drift. Using the span value measured every 24 hours during the field test, calculate the differences between the span value after cleaning, aligning, and adjustment of zero and span, and the span value 24 hours later just after cleaning, aligning, and adjustment of zero and before adjustment of span. Calculate the mean value of these points and the confidence interval using equations 1-1 and 1-2. Report the sum of the absolute mean value and the confidence interval.

9.2.7 Response Time. Using the data from paragraph 8.1, calculate the time interval from filter insertion to 95 percent of the final stable value for all upscale and downscale traverses. Report the mean of the 10 upscale and downscale test times.

9.2.8 Operational Test Period. During the 168-hour operational test period, the continuous monitoring system shall not require any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the manufacturer's operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system is operated within the specified performance parameters and does not require corrective maintenance, repair, replacement, or adjustment other than as specified above during the 168-hour test period, the operational test period shall have been successfully concluded. Failure of the continuous monitoring system to meet these requirements shall call for a repetition of the 168-hour test period. Portions of the tests which were satisfactorily completed need not be repeated. Failure to meet any performance specification(s) shall call for a repetition of the one-week operational test period and that specific portion of the tests required by paragraph 8 related to demonstrating compliance with the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

10. References.

10.1 "Experimental Statistics," Department of Commerce, National Bureau of Standards Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

10.2 "Performance Specifications for Stationary-Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.

Date of Test_____ Location of Test _____

Span Filter_____% Opacity

Analyzer Span Setting_____% Opacity

Upscale	1 _____	seconds
	2 _____	seconds
	3 _____	seconds
	4 _____	seconds
	5 _____	seconds
Downscale	1 _____	seconds
	2 _____	seconds
	3 _____	seconds
	4 _____	seconds
	5 _____	seconds
Average response	_____	seconds

Figure 1-2. Response Time Test

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Zero Setting _____ (See paragraph 8.2.1) Date of Test _____

Span Setting _____

Date and Time	Zero Reading (Before cleaning and adjustment)	Zero Drift (ΔZero)	Span Reading (After cleaning and zero adjustment but before span adjustment)	Calibration Drift (ΔSpan)

Zero Drift = Mean Zero Drift* _____ + CI (Zero) _____ = _____.

Calibration Drift = Mean Span Drift* _____ + CI (Span) _____ = _____.

*Absolute value

Figure 1-3. Zero and Calibration Drift Test

PERFORMANCE SPECIFICATION 2—PERFORMANCE SPECIFICATIONS AND SPECIFICATION TEST PROCEDURES FOR MONITORS OF SO_2 AND NO_x FROM STATIONARY SOURCES

1. Principle and Applicability.

1.1 Principle. The concentration of sulfur dioxide or oxides of nitrogen pollutants in stack emissions is measured by a continuously operating emission measurement system. Concurrent with operation of the continuous monitoring system, the pollutant concentrations are also measured with reference methods (Appendix A). An average of the continuous monitoring system data is computed for each reference method testing period and compared to determine the relative accuracy of the continuous monitoring system. Other tests of the continuous monitoring system are also performed to determine calibration error, drift, and response characteristics of the system.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of nitrogen oxides or sulfur dioxide pollutants. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems.

2. Apparatus.

2.1 Calibration Gas Mixtures. Mixtures of known concentrations of pollutant gas in a diluent gas shall be prepared. The pollutant gas shall be sulfur dioxide or the appropriate oxide(s) of nitrogen specified by paragraph 6 and within subparts. For sulfur dioxide gas mixtures, the diluent gas may be air or nitrogen. For nitric oxide (NO) gas mixtures, the diluent gas shall be oxygen-free (<10 ppm) nitrogen, and for nitrogen dioxide (NO_2) gas mixtures the diluent gas shall be air. Concentrations of approximately 50 percent and 90 percent of span are required. The 90 percent gas mixture is used to set and to check the span and is referred to as the span gas.

2.2 Zero Gas. A gas certified by the manufacturer to contain less than 1 ppm of the pollutant gas or ambient air may be used.

2.3 Equipment for measurement of the pollutant gas concentration using the reference method specified in the applicable standard.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

2.5 Continuous monitoring system for SO_2 or NO_x pollutants as applicable.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of a pollutant gas concentration in a source effluent. Continuous monitoring systems consist of major subsystems as follows:

3.1.1 Sampling Interface. That portion of an extractive continuous monitoring system that performs one or more of the following operations: acquisition, transportation, and conditioning of a sample fo the source effluent or that portion of an in-situ continuous monitoring system that protects the analyzer from the effluent.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of pollutant concentration at which the continuous monitoring system is set to produce the maximum data display output. The span shall be set at the concentration specified in each applicable subpart.

3.3 Accuracy (Relative). The degree of correctness with which the continuous monitoring system yields the value of gas concentration of a sample relative to the value given by a defined reference method. This accuracy is expressed in terms of error, which is the difference between the paired concentration measurements expressed as a percentage of the mean reference value.

3.4 Calibration Error. The difference between the pollutant concentration indicated by the continuous monitoring system and the known concentration of the test gas mixture.

3.5 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time for the measurements is zero.

3.6 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operations when the pollutant concentration at the time of the measurements is the same known upscale value.

3.7 Response Time. The time interval from a step change in pollutant concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is reached as displayed on the continuous monitoring system data recorder.

3.8 Operational Period. A minimum period of time over which a measurement system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.9 Stratification. A condition identified by a difference in excess of 10 percent between the average concentration in the duct or stack and the concentration at any point more than 1.0 meter from the duct or stack wall.

4. Installation Specifications. Pollutant continuous monitoring systems (SO_2 and NO_x) shall be installed at a sampling location where measurements can be made which are directly representative (4.1), or which can be corrected so as to be representative (4.2) of the total emissions from the affected facility. Conformance with this requirement shall be accomplished as follows:

4.1 Effluent gases may be assumed to be nonstratified if a sampling location eight or more stack diameters (equivalent diameters) downstream of any air in-leakage is selected. This assumption and data correction procedures under paragraph 4.2.1 may not be applied to sampling locations upstream of an air preheater in a stream generating facility under Subpart D of this part. For sampling locations where effluent gases are either demonstrated (4.3) or may be assumed to be nonstratified (eight diameters), a point (extractive systems) or path (in-situ systems) of average concentration may be monitored.

4.2 For sampling locations where effluent gases cannot be assumed to be nonstratified (less than eight diameters) or have been shown under paragraph 4.3 to be stratified, results obtained must be consistently representative (e.g. a point of average concentration may shift with load changes) or the data generated by sampling at a point (extractive systems) or across a path (in-situ systems) must be corrected (4.2.1 and 4.2.2) so as to be representative of the total emissions from the affected facility. Conformance with this requirement may be accomplished in either of the following ways:

4.2.1 Installation of a diluent continuous monitoring system (O_2 or CO_2 as applicable) in accordance with the procedures under paragraph 4.2 of Performance Specification 3 of this appendix. If the pollutant and diluent monitoring systems are not of the same type (both extractive or both in-situ), the extractive system must use a multipoint probe.

4.2.2 Installation of extractive pollutant monitoring systems using multipoint sampling probes or in-situ pollutant monitoring systems that sample or view emissions which are consistently representative of the

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total emissions for the entire cross section. The Administrator may require data to be submitted to demonstrate that the emissions sampled or viewed are consistently representative for several typical facility process operating conditions.

4.3 The owner or operator may perform a traverse to characterize any stratification of effluent gases that might exist in a stack or duct. If no stratification is present, sampling procedures under paragraph 4.1 may be applied even though the eight diameter criteria is not met.

4.4 When single point sampling probes for extractive systems are installed within the stack or duct under paragraphs 4.1 and 4.2.1, the sample may not be extracted at any point less than 1.0 meter from the stack or duct wall. Multipoint sampling probes installed under paragraph 4.2.2 may be located at any points necessary to obtain consistently representative samples.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 2-1 to be considered acceptable under this method.

TABLE 2-1—PERFORMANCE SPECIFICATIONS

Parameter	Specification
1. Accuracy [1]	<20 pct of the mean value of the reference method test data.
2. Calibration error [1]	<5 pct of each (50 pct, 90 pct) calibration gas mixture value.
3. Zero drift (2 h) [1]	2 pct of span.
4. Zero drift (24 h) [1]	Do.
5. Calibration drift (2 h) [1]	Do.
6. Calibration drift (24 h) [1]	2.5 pct of span.
7. Response time	15 min maximum.
8. Operational period	168 h minimum.

[1]Expressed as sum of absolute mean value plus 95 pct confidence interval of a series of tests.

6. Performance Specification Test Procedures. The following test procedures shall be used to determine conformance with the requirements of paragraph 5. For NO_x analyzers that oxidize nitric oxide (NO) to nitrogen dioxide (NO_2),the response time test under paragraph 6.3 of this method shall be performed using nitric oxide (NO) span gas. Other tests for NO_x continuous monitoring systems under paragraphs 6.1 and 6.2 and all tests for sulfur dioxide systems shall be performed using the pollutant span gas specified by each subpart.

6.1 Calibration Error Test Procedure. Set up and calibrate the complete continuous monitoring system according to the manufacturer's written instructions. This may be accomplished either in the laboratory or in the field.

6.1.1 Calibration Gas Analyses. Triplicate analyses of the gas mixtures shall be performed within two weeks prior to use using Reference Methods 6 for SO_2 and 7 for NO_x. Analyze each calibration gas mixture (50%, 90%) and record the results on the example sheet shown in Figure 2-1. Each sample test result must be within 20 percent of the averaged result or the tests shall be repeated. This step may be omitted for non-extractive monitors where dynamic calibration gas mixtures are not used (6.1.2).

6.1.2 Calibration Error Test Procedure. Make a total of 15 nonconsecutive measurements by alternately using zero gas and each calibration gas mixture concentration (e.g., 0%, 50%, 0%, 90%, 50%, 90%, 50%, 0%, etc.). For nonextractive continuous monitoring systems, this test procedure may be performed by using two or more calibration gas cells whose concentrations are certified by the manufacturer to be functionally equivalent to these gas concentrations. Convert the continuous monitoring system output readings to ppm and record the results on the example sheet shown in Figure 2-2.

6.2 Field Test for Accuracy (Relative), Zero Drift, and Calibration Drift. Install and operate the continuous monitoring system in accordance with the manufacturer's written instructions and drawings as follows:

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of the span so that negative zero drift can be quantified. Operate the system for an initial 168-hour conditioning period in normal operating manner.

6.2.2 Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period retaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.2.1 Field Test for Accuracy (Relative). For continuous monitoring systems employing extractive sampling, the probe tip for the continuous monitoring system and the probe tip for the Reference Method sampling train should be placed at adjacent locations in the duct. For NO_x continuous

monitoring systems, make 27 NO_2 concentration measurements, divided into nine sets, using the applicable reference method. No more than one set of tests, consisting of three individual measurements, shall be performed in any one hour. All individual measurements of each set shall be performed concurrently, or within a three-minute interval and the results averaged. For SO_2 continuous monitoring systems, make nine SO_2 concentration measurements using the applicable reference method. No more than one measurement shall be performed in any one hour. Record the reference method test data and the continuous monitoring system concentrations on the example data sheet shown in Figure 2-3.

6.2.2.2 Field Test for Zero Drift and Calibration Drift. For extractive systems, determine the values given by zero and span gas pollutant concentrations at two-hour intervals until 15 sets of data are obtained. For nonextractive measurement systems, the zero value may be determined by mechanically producing a zero condition that provides a system check of the analyzer internal mirrors and all electronic circuitry including the radiation source and detector assembly or by inserting three or more calibration gas cells and computing the zero point from the upscale measurements. If this latter technique is used, a graph(s) must be retained by the owner or operator for each measurement system that shows the relationship between the upscale measurements and the zero point. The span of the system shall be checked by using a calibration gas cell certified by the manufacturer to be functionally equivalent to 50 percent of span concentration. Record the zero and span measurements (or the computed zero drift) on the example data sheet shown in Figure 2-4. The two-hour periods over which measurements are conducted need not be consecutive but may not overlap. All measurements required under this paragraph may be conducted concurrent with tests under paragraph 6.2.2.1.

6.2.2.3 Adjustments. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the measurement system without operator intervention or initiation are allowable at any time. During the entire 168-hour operational test period, record on the example sheet shown in Figure 2-5 the values given by zero and span gas pollutant concentrations before and after adjustment at 24-hour intervals.

6.3 Field Test for Response Time.

6.3.1 Scope of Test. Use the entire continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates, pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one pollutant source (stack), repeat this test for each sampling point.

6.3.2 Response Time Test Procedure. Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of pollutant gas. Record the time from concentration switching to 95 percent of final stable response. For non-extractive monitors, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded. Perform this test sequence three (3) times. Record the results of each test on the example sheet shown in Figure 2-6.

7. Calculations, Data Analysis and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 2-1.

$$\bar{x}=\frac{1}{n}\sum_{i=1}^{n}x_i \qquad \text{Equation 2-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
$\bar{x}$ = mean value, and
n = number of data points.

7.1.2 The 95 percent confidence interval (two-sided) is calculated according to equation 2-2:

$$C.I._{95}=\frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\Sigma x_i^2)-(\Sigma x_i)^2} \qquad \text{Equation 2-2}$$

where:

Σx_i = sum of all data points, $t_{.975}=t_{1-\alpha/2}$, and
$C.I._{95}$ = 95 percent confidence interval estimate of the average mean value.

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VALUES FOR $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Accuracy (Relative). For each of the nine reference method test points, determine the average pollutant concentration reported by the continuous monitoring system. These average concentrations shall be determined from the continuous monitoring system data recorded under 7.2.2 by integrating or averaging the pollutant concentrations over each of the time intervals concurrent with each reference method testing period. Before proceeding to the next step, determine the basis (wet or dry) of the continuous monitoring system data and reference method test data concentrations. If the bases are not consistent, apply a moisture correction to either reference method concentrations or the continuous monitoring system concentrations as appropriate. Determine the correction factor by moisture tests concurrent with the reference method testing periods. Report the moisture test method and the correction procedure employed. For each of the nine test runs determine the difference for each test run by subtracting the respective reference method test concentrations (use average of each set of three measurements for NO_x) from the continuous monitoring system integrated or averaged concentrations. Using these data, compute the mean difference and the 95 percent confidence interval of the differences (equations 2-1 and 2-2). Accuracy is reported as the sum of the absolute value of the mean difference and the 95 percent confidence interval of the differences expressed as a percentage of the mean reference method value. Use the example sheet shown in Figure 2-3.

7.2.2 Calibration Error. Using the data from paragraph 6.1, subtract the measured pollutant concentration determined under paragraph 6.1.1 (Figure 2-1) from the value shown by the continuous monitoring system for each of the five readings at each concentration measured under 6.1.2 (Figure 2-2). Calculate the mean of these difference values and the 95 percent confidence intervals according to equations 2-1 and 2-2. Report the calibration error (the sum of the absolute value of the mean difference and the 95 percent confidence interval) as a percentage of each respective calibration gas concentration. Use example sheet shown in Figure 2-2.

7.2.3 Zero Drift (2-hour). Using the zero concentration values measured each 2-hours during the field test, calculate the differences between consecutive 2-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 2-1 and 2-2. Report the zero drift as the sum of the absolute mean value and the confidence interval as a percentage of span. Use example sheet shown in Figure 2-4.

7.2.4 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 2-1 and 2-2. Report the zero drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use example sheet shown in Figure 2-5.

7.2.5 Calibration Drift (2-hour). Using the calibration values obtained at 2-hour intervals during the field test, calculate the differences between consecutive 2-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that 2-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 2-1 and 2-2. Do not use the differences between non-consecutive readings. Report the calibration drift as the sum of the absolute mean and confidence interval as a percentage of span. Use the example sheet shown in Figure 2-4.

7.2.6 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment, and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate the mean value of these differences and the confidence interval using equations 2-1 and 2-2. Report the calibration drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use the example sheet shown in Figure 2-5.

7.2.7 Response Time. Using the charts from paragraph 6.3, calculate the time in-

terval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower time as the system response time. Use the example sheet shown in Figure 2-6.

7.2.8 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not require any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the operation and maintenance manuals as routine and expected during a 1-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168-hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the 1-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

8. References.

8.1 "Monitoring Instrumentation for the Measurement of Sulfur Dioxide in Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., February 1973.

8.2 "Instrumentation for the Determination of Nitrogen Oxides Content of Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., Volume 1, APTD-0847, October 1971; Volume 2, APTD-0942, January 1972.

8.3 "Experimental Statistics," Department of Commerce, Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

8.4 "Performance Specifications for Stationary Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.

Date _____ Reference Method Used ___

Mid-Range Calibration Gas Mixture

Sample 1 _____ ppm

Sample 2 _____ ppm

Sample 3 _____ ppm

Average _____ ppm

High-Range (span) Calibration Gas Mixture

Sample 1 _____ ppm

Sample 2 _____ ppm

Sample 3 _____ ppm

Average _____ ppm

Figure 2-1. Analysis of Calibration Gas Mixtures

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Calibration Gas Mixture Data (From Figure 2-1)

Mid (50%) _____ppm High (90%) _____ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences,[1] ppm
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Mid	High
Mean difference	____	____
Confidence interval	± ____	± ____
Calibration error = $\frac{\text{Mean Difference}^{2} + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	____%	____%

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

Figure 2-2. Calibration Error Determination

Test No.	Date and Time	Reference Method Samples: SO_2 Sample 1 (ppm)	NO_x Sample 1 (ppm)	NO_x Sample 2 (ppm)	NO_x Sample 3 (ppm)	NO_x Sample Average (ppm)	Analyzer 1-Hour Average (ppm)*: SO_2	Analyzer 1-Hour Average (ppm)*: NO_x	Difference (ppm): SO_2	Difference (ppm): NO_x
1										
2										
3										
4										
5										
6										
7										
8										
9										

Mean reference method test value (SO_2) _____ Mean reference method test value (NO_x) _____ Mean of the differences _____ _____

95% Confidence intervals = ± _____ ppm (SO_2) = ± _____ ppm (NO_x)

Accuracies = $\frac{\text{Mean of the differences} + \text{95\% confidence interval}}{\text{Mean reference method value}} \times 100$ = ____% (SO_2) = ____% (NO_x)

* Explain and report method used to determine integrated averages

Figure 2-3. Accuracy Determination (SO_2 and NO_x)

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span- Zero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* _____ + CI (Zero) _____] ÷ [Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ + CI (Span) _____] ÷ [Span] x 100 = _____.

*Absolute Value.

Figure 2-4. Zero and Calibration Drift (2 Hour)

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Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _____ + C.I. (Zero) _____]

÷ [Instrument Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ + C.I. (Span) _____]

÷ [Instrument Span] x 100 = _____.

* Absolute value

Figure 2-5. Zero and Calibration Drift (24-hour)

Date of Test _____

Span Gas Concentration _____ppm

Analyzer Span Setting _____ppm

Upscale	1	_____seconds
	2	_____seconds
	3	_____seconds
	Average upscale response	_____seconds
Downscale	1	_____seconds
	2	_____seconds
	3	_____seconds
	Average downscale response	_____seconds

System average response time (slower time) = _____seconds.

$$\%\text{deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = \_\_\_\_.$$

Figure 2-6. Response Time

PERFORMANCE SPECIFICATION 3—PERFORMANCE SPECIFICATIONS AND SPECIFICATION TEST PROCEDURES FOR MONITORS OF CO_2 AND O_2 FROM STATIONARY SOURCES.

1. Principle and Applicability.

1.1 Principle. Effluent gases are continuously sampled and are analyzed for carbon dioxide or oxygen by a continuous monitoring system. Tests of the system are performed during a minimum operating period to determine zero drift, calibration drift, and response time characteristics.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of carbon dioxide or oxygen. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems subject to approval by the Administrator. Sampling may include either extractive or non-extractive (in-situ) procedures.

2. Apparatus.

2.1 Continuous Monitoring System for Carbon Dioxide or Oxygen.

2.2 Calibration Gas Mixtures. Mixture of known concentrations of carbon dioxide or oxygen in nitrogen or air. Midrange and 90 percent of span carbon dioxide or oxygen concentrations are required. The 90 percent of span gas mixture is to be used to set and check the analyzer span and is referred to as span gas. For oxygen analyzers, if the span is higher than 21 percent O_2, ambient air may be used in place of the 90 percent of span calibration gas mixture. Triplicate analyses of the gas mixture (except ambient air) shall be performed within two weeks prior to use using Reference Method 3 of this part.

2.3 Zero Gas. A gas containing less than 100 ppm of carbon dioxide or oxygen.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of carbon dioxide or oxygen in a given source effluent. The system consists of three major subsystems:

3.1.1 Sampling Interface. That portion of the continuous monitoring system that performs one or more of the following operations: delineation, acquisition, transportation, and conditioning of a sample of the source effluent or protection of the analyzer from the hostile aspects of the sample or source environment.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of oxygen or carbon dioxide concentration at which the continuous monitoring system is set that produces the maximum data display output. For the purposes of this method, the span shall be set no less than 1.5 to 2.5 times the normal carbon dioxide or normal oxygen concentration in the stack gas of the affected facility.

3.3 Midrange. The value of oxygen or carbon dioxide concentration that is representative of the normal conditions in the stack gas of the affected facility at typical operating rates.

3.4 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the carbon dioxide or oxygen concentration at the time for the measurements is zero.

3.5 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operation when the carbon dioxide or oxygen continuous monitoring system is measuring the concentration of span gas.

3.6 Operational Test Period. A minimum period of time over which the continuous monitoring system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.7 Response time. The time interval from a step change in concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is displayed on the continuous monitoring system data recorder.

4. Installation Specification.

Oxygen or carbon dioxide continuous monitoring systems shall be installed at a location where measurements are directly representative of the total effluent from the affected facility or representative of the same effluent sampled by a SO_2 or NO_x continuous monitoring system. This requirement shall be complied with by use of applicable requirements in Performance Specification 2 of this appendix as follows:

4.1 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Not Used to Convert Pollutant Data. A sampling location shall be selected in accordance with the procedures under paragraphs 4.2.1 or 4.2.2, or Performance Specification 2 of this appendix.

4.2 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Used to Convert Pollutant Continuous Monitoring System Data to Units of Applicable

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Standards. The diluent continuous monitoring system (oxygen or carbon dioxide) shall be installed at a sampling location where measurements that can be made are representative of the effluent gases sampled by the pollutant continuous monitoring system(s). Conformance with this requirement may be accomplished in any of the following ways:

4.2.1 The sampling location for the diluent system shall be near the sampling location for the pollutant continuous monitoring system such that the same approximate point(s) (extractive systems) or path (in-situ systems) in the cross section is sampled or viewed.

4.2.2 The diluent and pollutant continuous monitoring systems may be installed at different locations if the effluent gases at both sampling locations are nonstratified as determined under paragraphs 4.1 or 4.3, Performance Specification 2 of this appendix and there is no in-leakage occurring between the two sampling locations. If the effluent gases are stratified at either location, the procedures under paragraph 4.2.2, Performance Specification 2 of this appendix shall be used for installing continuous monitoring systems at that location.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 3-1 to be considered acceptable under this method.

6. Performance Specification Test Procedures.

The following test procedures shall be used to determine conformance with the requirements of paragraph 4. Due to the wide variation existing in analyzer designs and principles of operation, these procedures are not applicable to all analyzers. Where this occurs, alternative procedures, subject to the approval of the Administrator, may be employed. Any such alternative procedures must fulfill the same purposes (verify response, drift, and accuracy) as the following procedures, and must clearly demonstrate conformance with specifications in Table 3-1.

6.1 Calibration Check. Establish a calibration curve for the continuous monitoring system using zero, midrange, and span concentration gas mixtures. Verify that the resultant curve of analyzer reading compared with the calibration gas value is consistent with the expected response curve as described by the analyzer manufacturer. If the expected response curve is not produced, additional calibration gas measurements shall be made, or additional steps undertaken to verify the accuracy of the response curve of the analyzer.

6.2 Field Test for Zero Drift and Calibration Drift. Install and operate the continuous monitoring system in accordance with the manufacturer's written instructions and drawings as follows:

TABLE 3-1—PERFORMANCE SPECIFICATIONS

Parameter	Specification
1. Zero drift (2 h) [1]	0.4 pct O_2 or CO_2.
2. Zero drift (24 h) [1]	0.5 pct O_2 or CO_2.
3. Calibration drift (2 h) [1]	0.4 pct O_2 or CO_2.
4. Calibration drift (24 h) [1]	0.5 pct O_2 or CO_2.
5. Operational period	168 h minimum.
6. Response time	10 min.

[1]Expressed as sum of absolute mean value plus 95 pct confidence interval of a series of tests.

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of span so that negative zero drift may be quantified. Operate the continuous monitoring system for an initial 168-hour conditioning period in a normal operational manner.

6.2.2. Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period maintaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.3 Field Test for Zero Drift and Calibration Drift. Determine the values given by zero and midrange gas concentrations at two-hour intervals until 15 sets of data are obtained. For non-extractive continuous monitoring systems, determine the zero value given by a mechanically produced zero condition or by computing the zero value from upscale measurements using calibrated gas cells certified by the manufacturer. The midrange checks shall be performed by using certified calibration gas cells functionally equivalent to less than 50 percent of span. Record these readings on the example sheet shown in Figure 3-1. These two-hour periods need not be consecutive but may not overlap. In-situ CO_2 or O_2 analyzers which cannot be fitted with a calibration gas cell may be calibrated by alternative procedures acceptable to the Administrator. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the continuous monitoring system without operator intervention or initiation are allowable at any time. During the entire 168-hour test period, record the values given by zero and span gas concentrations before and after adjustment at 24-hour intervals in the example sheet shown in Figure 3-2.

6.3 Field Test for Response Time.

6.3.1 Scope of Test.

This test shall be accomplished using the continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates,

pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one source (stack), this test shall be repeated for each sampling point.

6.3.2 Response Time Test Procedure.

Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of gas at 90 percent of span. Record the time from concentration switching to 95 percent of final stable response. After the system response has stabilized at the upper level, switch quickly to a zero gas. Record the time from concentration switching to 95 percent of final stable response. Alternatively, for nonextractive continuous monitoring systems, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded. Perform this test sequence three (3) times. For each test, record the results on the data sheet shown in Figure 3-3.

7. Calculations, Data Analysis, and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 3-1.

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \qquad \text{Equation 3-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
$\bar{x}$ = mean value, and
n = number of data points.

7.2.1 The 95 percent confidence interval (two-sided) is calculated according to equation 3-2:

$$C.I._{.95} = \frac{t_{.975}}{n\sqrt{n-1}} \sqrt{n(\sum x_i^2) - (\sum x_i)^2} \qquad \text{Equation 3-2}$$

where:

ΣX = sum of all data points,
$t_{.975} = t_{1-\alpha/2}$, and
$C.I._{.95}$ = 95 percent confidence interval estimates of the average mean value.

VALUES FOR $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Zero Drift (2-hour). Using the zero concentration values measured each two hours during the field test, calculate the differences between the consecutive two-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 3-1 and 3-2. Record the sum of the absolute mean value and the confidence interval on the data sheet shown in Figure 3-1.

7.2.2 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 3-1 and 3-2. Record the zero drift (the sum of the absolute mean and confidence interval) on the data sheet shown in Figure 3-2.

7.2.3 Calibration Drift (2-hour). Using the calibration values obtained at two-hour intervals during the field test, calculate the differences between consecutive two-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that two-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 3-1 and 3-2. Do not use the differences between non-consecutive readings. Record the sum of the absolute mean and confidence interval upon the data sheet shown in Figure 3-1.

7.2.4 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate

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the mean value of these differences and the confidence interval using equations 3-1 and 3-2. Record the sum of the absolute mean and confidence interval on the data sheet shown in Figure 3-2.

7.2.5 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not receive any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the manufacturer's written operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168 hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the one-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

7.2.6 Response Time. Using the data developed under paragraph 5.3, calculate the time interval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower time as the system response time. Record the results on Figure 3-3.

8. References.

8.1 "Performance Specifications for Stationary Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.

8.2 "Experimental Statistics," Department of Commerce, National Bureau of Standards Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (ΔSpan-ΔZero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* _____ + CI (Zero) _____] = _____.
Calibration Drift = [Mean Span Drift* _____ + CI (Span _____] = _____.
*Absolute Value.

Figure 3-1. Zero and Calibration Drift (2 Hour).

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _____ + C.I. (Zero) _____]

= _____.

Calibration Drift = [Mean Span Drift* _____ + C.I. (Span) _____]

= _____.

* Absolute value

Figure 3-2. Zero and Calibration Drift (24-hour)

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Date of Test _____

Span Gas Concentration _____ ppm

Analyzer Span Setting _____ ppm

Upscale
1. _____ seconds
2. _____ seconds
3. _____ seconds

Average upscale response _____ seconds

Downscale
1. _____ seconds
2. _____ seconds
3. _____ seconds

Average downscale response _____ seconds

System average response time (slower time) = _____ seconds

% deviation from slower system average response = $\frac{\text{average upscale minus average downscale}}{\text{slower time}} \times 100\%$

= _____.

Figure 3-3. Response

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 46259, Oct. 5, 1975; 40 FR 59204, Dec. 22, 1975, as amended at 42 FR 5937, Jan. 31, 1977]

Appendix C—Determination of Emission Rate Change

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, E, for each set of data using Equation 1.

$$E=\frac{\sum_{i=1}^{n} E_i}{n}=\frac{E_1+E_2\ldots+E_n}{n} \quad (1)$$

where:

E_i = Emission rate for the i th run.

n = number of runs.

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2=\frac{\sum_{i=1}^{n}(E_i-E)^2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1} \quad (2)$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

$$S_p=\left[\frac{(n_a-1)\ S_a^2+(n_b-1)\ S_b^2}{n_a+n_b-2}\right]^{1/2} \quad (3)$$

3.5 Calculate the test statistic, t, using Equation 4.

$$t=\frac{E_b-E_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}} \quad (4)$$

4. *Results.*

4.1 If $E_b>E_a$ and $t>t'$, where t' is the critical value of t obtained from Table 1, then with 95% confidence the difference between E_b and E_a is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of freedom (n_a+n_b-2)	t' (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

5.1 Assume the two performance tests produced the following set of data:

Test a	Test b
Run 1. 100	115
Run 2. 95	120
Run 3. 110	125

5.2 Using Equation 1—

$$E_a=100+95+110/3=102$$
$$E_b=115+120+125/3=120$$

5.3 Using Equation 2—

$$S_a^2=(100-102)^2+(95-102)^2+(110-102)^2/3-1=58.5$$
$$S_b^2=(115-120)^2+(120-120)^2+(125-120)^2/3-1=25$$

5.4 Using Equation 3—

$$S_p=[(3-1)(58.5)+(3+1)(25)/3+3-2]^{1/2}=6.46$$

5.5 Using Equation 4—

$$t=\frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}}=3.412$$

5.6 Since $(n^1+n^2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of E_a and E_b is significant, and there has been an increase in emission rate to the atmosphere.

6. *Continuous Monitoring Data.*

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

(Sec. 114, Clean Air Act as amended 42 U.S.C. 7414))

[40 FR 58420, Dec. 16, 1975]

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Appendix D—Required Emission Inventory Information

(a) Completed NEDS point source form(s) for the entire plant containing the designated facility, including information on the applicable criteria pollutants. If data concerning the plant are already in NEDS, only that information must be submitted which is necessary to update the existing NEDS record for that plant. Plant and point identification codes for NEDS records shall correspond to those previously assigned in NEDS; for plants not in NEDS, these codes shall be obtained from the appropriate Regional Office.

(b) Accompanying the basic NEDS information shall be the following information on each designated facility:

(1) The state and county identification codes, as well as the complete plant and point identification codes of the designated facility in NEDS. (The codes are needed to match these data with the NEDS data.)

(2) A description of the designated facility including, where appropriate:

(i) Process name.

(ii) Description and quantity of each product (maximum per hour and average per year).

(iii) Description and quantity of raw materials handled for each product (maximum per hour and average per year).

(iv) Types of fuels burned, quantities and characteristics (maximum and average quantities per hour, average per year).

(v) Description and quantity of solid wastes generated (per year) and method of disposal.

(3) A description of the air pollution control equipment in use or proposed to control the designated pollutant, including:

(i) Verbal description of equipment.

(ii) Optimum control efficiency, in percent. This shall be a combined efficiency when more than one device operates in series. The method of control efficiency determination shall be indicated (e.g., design efficiency, measured efficiency, estimated efficiency).

(iii) Annual average control efficiency, in percent, taking into account control equipment down time. This shall be a combined efficiency when more than one device operates in series.

(4) An estimate of the designated pollutant emissions from the designated facility (maximum per hour and average per year). The method of emission determination shall also be specified (e.g., stack test, material balance, emission factor).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 5334[illegible], Nov. 17, 1975]

PART 61—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

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APPENDIX A—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS, COMPLIANCE STATUS INFORMATION
APPENDIX B—TEST METHODS
Method 101—Reference method for determination of particulate and gaseous mercury emissions from stationary sources (air streams).
Method 101A—Determination of particulate and gaseous mercury emissions from sewage sludge incinerations.
Method 102—Determination of particulate and gaseous mercury emissions from chlor-alkali plants—hydrogen streams.
Method 103—Beryllium screening method.
Method 104—Reference method for determination of beryllium emissions from stationary sources.
Method 105—Method for determination of mercury in wastewater treatment plant sewage sludges.
Method 106—Determination of vinyl chloride from stationary sources.
Method 107—Determination of vinyl chloride content of inprocess wastewater samples, and vinyl chloride content of polyvinyl chloride resin, slurry, wet cake, and latex samples.

AUTHORITY: Sec. 112, 301(a), Clean Air Act as amended (42 U.S.C. 7412, 7601(a)), unless otherwise noted.

SOURCE: 38 FR 8826, Apr. 6, 1973, unless otherwise noted.

Subpart A—General Provisions

§ 61.01 Applicability.

The provisions of this part apply to the owner or operator of any stationary source for which a standard is prescribed under this part.

§ 61.02 Definitions.

The terms used in this part are defined in the Act or in this section as follows:

"Act" means the Clean Air Act (42 U.S.C. 1857 et seq.).

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Administrator's satisfaction to, in specific cases, produce results adequate for his determination of compliance.

"Commenced" means, with respect to the definition of "new source" in section 111(a)(2) of the Act, that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.

"Compliance schedule" means the date or dates by which a source or category of sources is required to comply with the standards of this part and with any steps toward such compliance which are set forth in a waiver of compliance under § 61.11.

"Construction" means fabrication, erection, or installation of an affected facility.

"Effective date" is the date of promulgation in the FEDERAL REGISTER of an applicable standard or other regulation under this part.

"Equivalent method" means any method of sampling and analyzing for an air pollutant which has been demonstrated to the Administrator's satisfaction to have a consistent and quantitatively known relationship to the reference method, under specified conditions.

"Existing source" means any stationary source which is not a new source.

"Modification" means any physical change in, or change in the method of operation of, a stationary source which increases the amount of any hazardous air pollutant emitted by

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such source or which results in the emission of any hazardous air pollutant not previously emitted, except that:

(a) Routine maintenance, repair, and replacement shall not be considered physical changes, and

(b) The following shall not be considered a change in the method of operation:

(1) An increase in the production rate, if such increase does not exceed the operating design capacity of the stationary source;

(2) An increase in hours of operation.

"New source" means any stationary source, the construction or modification of which is commenced after the publication in the FEDERAL REGISTER of proposed national emission standards for hazardous air pollutants which will be applicable to such source.

"Owner or operator" means any person who owns, leases, operates, controls, or supervises a stationary source.

"Reference method" means any method of sampling and analyzing for an air pollutant, as described in Appendix B to this part.

"Standard" means a national emission standard for a hazardous air pollutant proposed or promulgated under this part.

"Startup" means the setting in operation of a stationary source for any purpose.

"Stationary source" means any building, structure, facility, or installation which emits or may emit any air pollutant which has been designated as hazardous by the Administrator.

[44 FR 55174, Sept. 25, 1979]

§ 61.03 Units and abbreviations.

Used in this part are abbreviations and symbols of units of measure. These are defined as follows:

(a) System International (SI) units of measure:

A = ampere
g = gram
Hz = hertz
J = joule
K = degree Kelvin
kg = kilogram
m = meter
m^3 = cubic meter
mg = milligram = 10^{-3} gram
mm = millimeter = 10^{-3} meter
Mg = megagram = 10^{6} gram
mol = mole
N = newton
ng = nanogram = 10^{-9} gram
nm = nanometer = 10^{-9} meter
Pa = pascal
s = second
V = volt
W = watt
Ω = ohm
μg = microgram = 10^{-6} gram

(b) Other units of measure:

°C = degree Celsius (centigrade)
cfm = cubic feet per minute
cc = cubic centimeter
d = day
°F = degree Fahrenheit
ft^2 = square feet
ft^3 = cubic feet
gal = gallon
in = inch
in Hg = inches of mercury
in H_2O = inches of water
l = liter
lb = pound
lpm = liter per minute
min = minute
ml = milliliter = 10^{-3} liter
oz = ounces
psig = pounds per square inch gage
°R = degree Rankine
μl = microliter = 10^{-6} liter
v/v = volume per volume
yd^2 = square yards
yr = year

(c) Chemical nomenclature:

Be = beryllium
Hg = mercury
H_2O = water

(d) Miscellaneous:

act = actual
avg = average
I.D. = inside diameter
M = molar
N = normal
O.D. = outside diameter
% = percent
std = standard

(Secs. 112 and 301(a), Clean Air Act, as amended (42 U.S.C. 1857c-7, 1857g(a)))

[42 FR 51574, Sept. 29, 1977]

§ 61.04 Address.

(a) All requests, reports, applications, submittals, and other communications to the Administrator pursuant to this part shall be submitted in duplicate and addressed to the appropri-

ate Regional Office of the Environmental Protection Agency, to the attention of the Director, Enforcement Division. The regional offices are as follows:

Region I (Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, Vermont), John F. Kennedy Federal Building, Boston, Massachusetts 02203.

Region II (New York, New Jersey, Puerto Rico, Virgin Islands), Federal Office Building, 26 Federal Plaza (Foley Square), New York, N.Y. 10007.

Region III (Delaware, District of Columbia, Pennsylvania, Maryland, Virginia, West Virginia), Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

Region IV (Alabama, Florida, Georgia, Mississippi, Kentucky, North Carolina, South Carolina, Tennessee), Suite 300, 1421 Peachtree Street, Atlanta, Georgia 30309.

Region V (Illinois, Indiana, Minnesota, Michigan, Ohio, Wisconsin), 230 South Dearborn Street, Chicago, Illinois 60604.

Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, Texas), 1600 Patterson Street, Dallas, Texas 75201.

Region VII (Iowa, Kansas, Missouri, Nebraska), 324 East 11th Street, Kansas City, Missouri 64106.

Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming), 196 Lincoln Towers, 1860 Lincoln Street, Denver, Colorado 80203.

Region IX (Arizona, California, Hawaii, Nevada, Guam, American Samoa), 100 California Street, San Francisco, California 94111.

Region X (Washington, Oregon, Idaho, Alaska), 1200 Sixth Avenue, Seattle, Washington 98101.

(b) Section 112(d) directs the Administrator to delegate to each State, when appropriate, the authority to implement and enforce the national emission standards for hazardous air pollutants for stationary sources located in such State. All information required to be submitted to EPA under paragraph (a) of this section, must also be submitted to the appropriate State Agency of any State to which this authority has been delegated (provided, that each specific delegation may exempt sources from a certain federal or State reporting requirement). The appropriate mailing address for those States whose delegation request has been approved is as follows:

(A) [Reserved]

(B) State of Alabama, Air Pollution Control Division, Air Pollution Control Commission, 645 S. McDonough Street, Montgomery, Alabama 36104.

(C) [Reserved]

(D) Arizona.

Maricopa County Department of Health Services, Bureau of Air Pollution Control, 1825 East Roosevelt Street, Phoenix, Ariz. 85006.

Pima County Health Department, Air Quality Control District, 151 West Congress, Tucson, Ariz. 85701.

(E) State of Arkansas, Program Administrator, Air and Hazardous Materials Division, Arkansas Department of Pollution Control and Ecology, 8001 National Drive, Little Rock, Arkansas 72209 (with the exception of (1)(d) Demolition and Renovation of Buildings Containing Asbestos).

(F) California.

Amador County Air Pollution Control District, P.O. Box 430, 810 Court Street, Jackson, CA 95642.

Bay Area Air Pollution Control District, 939 Ellis Street, San Francisco, Calif. 94109.

Butte County Air Pollution Control District, P.O. Box 1229, 316 Nelson Avenue, Oroville, CA 95965.

Calaveras County Air Pollution Control District, Government Center, El Dorado Road, San Andreas, CA 95249.

Colusa County Air Pollution Control District, 751 Fremont Street, Colusa, CA 95952.

Del Norte County Air Pollution Control District, 909 Highway 101 North, Crescent City, CA 95531.

El Dorado Air Pollution Control District, 330 Fair Lane, Placerville, CA 95667.

Fresno County Air Pollution Control District, P.O. Box 11867, 1246 L Street, Fresno, CA 93721.

Glenn County Air Pollution Control District, P.O. Box 351, 720 North Colusa Street, Willows, CA 95988.

Great Basin Unified Air Pollution Control District, 863 North Main Street, Suite 213, Bishop, CA 93514.

Humboldt County Air Pollution Control District, 5600 South Broadway, Eureka, Calif. 95501.

Imperial County Air Pollution Control District, County Services Building, 939 West Main Street, El Centro, CA 92243.

Kern County Air Pollution Control District, 1700 Flower Street (P.O. Box 997), Bakersfield, Calif. 93302.

Kings County Air Pollution Control District, 330 Campus Drive, Hanford, CA 93230.

Lake County Air Pollution Control District, 255 North Forbes Street, Lakeport, CA 95453.

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Lassen County Air Pollution Control District, 175 Russell Avenue, Susanville, CA 96130.

Madera County Air Pollution Control District, 135 West Yosemite Avenue, Madera, Calif. 93637.

Mariposa County Air Pollution Control District, Box 5, Mariposa, CA 95338.

Mendocino County Air Pollution Control District, County Courthouse, Ukiah, Calif. 94582.

Merced County Air Pollution Control District, P.O. Box 471, 240 East 15th Street, Merced, CA 95340.

Modoc County Air Pollution Control District, 202 West 4th Street, Alturas, CA 96101.

Monterey Bay Unified Air Pollution Control District, 1270 Natividad Road, Room 105, Salinas, CA 93906.

Nevada County Air Pollution Control District, H.E.W. Complex, Nevada City, CA 95959.

Northern Sonoma County Air Pollution Control District, 134 "A" Avenue, Auburn, CA 95448.

Placer County Air Pollution Control District, 11491 "B" Avenue, Auburn, CA 95603.

Plumas County Air Pollution Control District, P.O. Box 480, Quincy, CA 95971.

Sacramento County Air Pollution Control District, 3701 Branch Center Road, Sacramento, Calif. 95827.

San Bernardino County Air Pollution Control District, 15579-8th, Victorville, CA 92392.

San Diego County Air Pollution Control District, 9150 Chesapeake Drive, San Diego, Calif. 92123.

San Joaquin County Air Pollution Control District, 1601 East Hazelton Street (P.O. Box 2009), Stockton, Calif. 95201.

San Luis Obispo County Air Pollution Control District, P.O. Box 637, San Luis Obispo, CA 93406.

Santa Barbara County Air Pollution Control District, 300 North San Antonio Road, Santa Barbara, CA 93110.

Shasta County Air Pollution Control District, 2650 Hospital Lane, Redding, CA 96001.

Sierra County Air Pollution Control District, P.O. Box 286, Downieville, CA 95936.

Siskiyou County Air Pollution Control District, 525 South Foothill Drive, Yreka, CA 96097.

South Coast Air Quality Management District, 9150 Flair Drive, El Monte, CA 91731.

Stanislaus County Air Pollution Control District, 1030 Scenic Drive, Modesto, CA 95350.

Sutter County Air Pollution Control District, Sutter County Office Building, 142 Garden Highway, Yuba City, CA 95991.

Tehama County Air Pollution Control District, P.O. Box 38, 1760 Walnut Street, Red Bluff, CA 96080.

Trinity County Air Pollution Control District, P.O. Box AK, Weaverville, CA 96093.

Tulare County Air Pollution Control District, County Civic Center, Visalia, CA 93277.

Tuolumne County Air Pollution Control District, 9 North Washington Street, Sonora, CA 95370.

Ventura County Air Pollution Control District, 800 South Victoria Avenue, Ventura, CA 93009.

Yolo-Solano Air Pollution Control District, P.O. Box 1006, 323 First Street, #5, Woodland, CA 95695

(G) State of Colorado, Colorado Air Pollution Control Division, 4210 East 11th Avenue, Denver, Colorado 80220.

(H) State of Connecticut, Department of Environmental Protection, State Office Building, Hartford, Connecticut 06115.

(I) State of Delaware (for asbestos, beryllium, mercury and vinyl chloride):

Delaware Department of Natural Resources and Environmental Control, Tatnall Building, P.O. Box 1401, Dover, Delaware 19901

(J)-(K) [Reserved]

(L) State of Georgia, Environmental Protection Division, Department of Natural Resources, 270 Washington Street, S.W., Atlanta, Georgia 30334.

(M)-(O) [Reserved]

(P) State of Indiana, Indiana Air Pollution Control Board, 1330 West Michigan Street, Indianapolis, Indiana 46206.

(Q) Iowa Department of Environmental Quality, Henry A. Wallace Building, 900 East Grand, Des Moines, Iowa 50316

(R) [Reserved]

(S) Division of Air Pollution Control, Department for Natural Resources and Environmental Protection, U.S. 127, Frankfort, Ky. 40601.

(T) [Reserved]

(U) State of Maine, Department of Environmental Protection, State House, Augusta, Maine 04330.

(V) State of Maryland, Bureau of Air Quality and Noise Control, Maryland State Department of Health and Mental Hygiene, 201 West Preston Street, Baltimore, Maryland 21201.

(W) Massachusetts Department of Environmental Quality Engineering, Division of Air Quality Control, 600 Washington Street, Boston, Massachusetts 02111.

(X) State of Michigan, Air Pollution Control Division, Michigan Department of Natural Resources, Stevens T. Mason Building, 8th Floor, Lansing, Michigan 48926.

(Y) Minnesota Pollution Control Agency, Division of Air Quality, 1935 West County Road B-2, Roseville, Minn. 55113.

(Z) Bureau of Pollution Control, Department of Natural Resources, P.O. Box 10385, Jackson, Mississippi 39209.

(AA) Missouri Department of Natural Resources, Post Office Box 1368, Jefferson City, Missouri 65101.

(BB) State of Montana, Department of Health and Environmental Sciences, Cogswell Building, Helena, Mont. 59601.

(CC) State of Nebraska, Nebraska Department of Environmental Control, P.O. Box 94877, State House Station, Lincoln, Nebraska 68509

(DD) Nevada.

Clark County, County District Health Department, Air Pollution Control Division, 625 Shadow Lane, Las Vegas, Nev. 89106.

Washoe County District Health Department, Division of Environmental Protection, 10 Kirman Avenue, Reno, Nev. 89502.

(EE) New Hampshire Air Pollution Control Agency, Department of Health and Welfare, State Laboratory Building, Hazen Drive, Concord, New Hampshire 03301.

(FF) State of New Jersey: New Jersey Department of Environmental Protection, John Fitch Plaza, P.O. Box 2807, Trenton, New Jersey 08625.

(GG) [Reserved]

(HH) New York: New York State Department of Environmental Conservation, 50 Wolf Road, Albany, New York 12233, attention: Division of Air Resources.

(II) North Carolina Environmental Management Commission, Department of Natural and Economic Resources, Division of Environmental Management, P.O. Box 27687, Raleigh, North Carolina 27611. Attention: Air Quality Section.

(JJ) State of North Dakota, State Department of Health, State Capitol, Bismarck, North Dakota 58501.

(KK) Ohio

Montgomery County: Regional Air Pollution Control Agency, Montgomery County Combined General Health District, 451 West Third Street, Dayton, Ohio 45402.

Clarke, Darke, Greene, Miami and Preble Counties [except for all information required under § 61.22 (d) and (e)]: Montgomery County Combined General Health District, 451 West Third Street, Dayton, Ohio 45402.

(LL) State of Oklahoma, Oklahoma State Department of Health, Air Quality Service, P.O. Box 53551, Oklahoma City, Oklahoma 73152.

(MM) State of Oregon, Department of Environmental Quality, 1234 SW Morrison Street, Portland, Oregon 97205.

(i)—(vii) [Reserved]

(viii) Lane Regional Air Pollution Authority, 1244 Walnut Street, Eugene, Oregon 97403.

(NN)(i) Commonwealth of Pennsylvania (except for City of Philadelphia and Allegheny County) Pennsylvania Department of Environmental Resources, Bureau of Air Quality and Noise Control, Post Office Box 2063, Harrisburg, Pennsylvania 17120.

(ii) City of Philadelphia, Philadelphia Department of Public Health Air Management Services, 801 Arch Street, Philadelphia, Pennsylvania 19107.

(OO) State of Rhode Island, Department of Environmental Management, 83 Park Street, Providence, R.I. 02908.

(PP) State of South Carolina, Office of Environmental Quality Control, Department of Health and Environmental Control, 2600 Bull Street, Columbia, South Carolina 29201.

(QQ) [Reserved]

(RR) Division of Air Pollution Control, Tennessee Department of Public Health, 256 Capitol Hill Building, Nashville, Tennessee 37219.

(SS) State of Texas, Texas Air Control Board, 8520 Shoal Creek Boulevard, Austin, Texas 78758.

(TT) [Reserved]

(UU) State of Vermont, Agency of Environmental Protection, Box 489, Montpelier, Vermont 05602.

(VV) Commonwealth of Virginia, Virginia State Air Pollution Control Board, Room 1106, Ninth Street Office Building, Richmond, Virginia 23219.

(WW)(i) Washington; State of Washington, Department of Ecology, Olympia, Washington 98504.

(ii) Northwest Air Pollution Authority, 207 Pioneer Building, Second and Pine Streets, Mount Vernon, Washington 98273.

(iii) Puget Sound Air Pollution Control Agency, 410 West Harrison Street, Seattle, Washington 98119.

(iv) Spokane County Air Pollution Control Authority, North 811 Jefferson, Spokane, Washington 99201.

(v) Yakima County Clean Air Authority, County Courthouse, Yakima, Washington 98901.

(vi) Olympic Air Pollution Control Authority, 120 East State Avenue, Olympia, Washington 98501.

(vii) Southwest Air Pollution Control Authority, Suite 7601 H, NE Hazel Dell Avenue, Vancouver, Washington 98665.

(XX) [Reserved]

(YY) Wisconsin—Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, Wisconsin 53707.

(ZZ) [Reserved]

(AAA) [Reserved]

(BBB) Commonwealth of Puerto Rico: Commonwealth of Puerto Rico Environmental Quality Board, P.O. Box 11785, Santurce, P.R. 00910.

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(CCC) U.S. Virgin Islands: U.S. Virgin Islands Department of Conservation and Cultural Affairs, P.O. Box 578, Charlotte Amalie, St. Thomas, U.S. Virgin Islands 00801.

(Secs. 101, 110, 111, 114, 160-169, 301 of the Clean Air Act, as amended, (42 U.S.C. 7401, 7410, 7411, 7414, 7470—7479, 7491, 7601))

[40 FR 18170, Apr. 25, 1975]

NOTE: For Federal Register citations to § 61.04 see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

§ 61.05 Prohibited activities.

(a) After the effective date of any standard prescribed under this part, no owner or operator shall construct or modify any stationary source subject to such standard without first obtaining written approval of the Administrator in accordance with this subpart, except under an exemption granted by the President under section 112(c)(2) of the act. Sources, the construction or modification of which commenced after the publication date of the standards proposed to be applicable to such source, are subject to this prohibition.

(b) After the effective date of any standard prescribed under this part, no owner or operator shall operate any new source in violation of such standard except under an exemption granted by the President under section 112(c)(2) of the act.

(c) Ninety days after the effective date of any standard prescribed under this part, no owner or operator shall operate any existing stationary source in violation of such standard, except under a waiver granted by the Administrator in accordance with this subpart or under an exemption granted by the President under section 112(c)(2) of the act.

(d) No owner or operator subject to the provisions of this part shall fail to report, revise reports, or report source test results as required under this part.

§ 61.06 Determination of construction or modification.

Upon written application by an owner or operator, the Administrator will make a determination of whether actions taken or intended to be taken by such owner or operator constitute construction or modification or the commencement thereof within the meaning of this part. The Administrator will within 30 days of receipt of sufficient information to evaluate an application, notify the owner or operator of his determination.

§ 61.07 Application for approval of construction or modification.

(a) The owner or operator of any new source to which a standard prescribed under this part is applicable shall, prior to the date on which construction or modification is planned to commence, or within 30 days after the effective date in the case of a new source that already has commenced construction or modification and has not begun operation, submit to the Administrator an application for approval of such construction or modification. A separate application shall be submitted for each stationary source.

(b) Each application shall include:

(1) The name and address of the applicant.

(2) The location or proposed location of the source.

(3) Technical information describing the proposed nature, size, design, operating design capacity, and method of operation of the source, including a description of any equipment to be used for control of emissions. Such technical information shall include calculations of emission estimates in sufficient detail to permit assessment of the validity of such calculations.

§ 61.08 Approval by Administrator.

(a) The Administrator will, within 60 days of receipt of sufficient information to evaluate an application under § 61.07, notify the owner or operator of approval or intention to deny approval of construction or modification.

(b) If the Administrator determines that a stationary source for which an application pursuant to § 61.07 was submitted will, if properly operated, not cause emissions in violation of a standard, he will approve the construction or modification of such source.

(c) Prior to denying any application for approval of construction or modification pursuant to this section, the

Administrator will notify the owner or operator making such application of the Administrator's intention to issue such denial, together with:

(1) Notice of the information and findings on which such intended denial is based, and

(2) Notice of opportunity for such owner or operator to present, within such time limit as the Administrator shall specify, additional information or arguments to the Administrator prior to final action on such application.

(d) A final determination to deny any application for approval will be in writing and will set forth the specific grounds on which such denial is based. Such final determination will be made within 60 days of presentation of additional information or arguments, or 60 days after the final date specified for presentation, if no presentation is made.

(e) Neither the submission of an application for approval nor the Administrator's granting of approval to construct or modify shall:

(1) Relieve an owner or operator of legal responsibility for compliance with any applicable provision of this part or of any other applicable Federal, State, or local requirement, or

(2) Prevent the Administrator from implementing or enforcing this part or taking any other action under the act.

§ 61.09 Notification of startup.

(a) Any owner or operator of a source which has an initial startup after the effective date of a standard prescribed under this part shall furnish the Administrator written notification as follows:

(1) A notification of the anticipated date of initial startup of the source not more than 60 days nor less than 30 days prior to such date.

(2) A notification of the actual date of initial startup of the source within 15 days after such date.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.10 Source reporting and waiver request.

(a) The owner or operator of any existing source, or any new source to which a standard prescribed under this part is applicable which had an initial startup which preceded the effective date of a standard prescribed under this part shall, within 90 days after the effective date, provide the following information in writing to the Administrator:

(1) Name and address of the owner or operator.

(2) The location of the source.

(3) The type of hazardous pollutants emitted by the stationary source.

(4) A brief description of the nature, size, design, and method of operation of the stationary source including the operating design capacity of such source. Identify each point of emission for each hazardous pollutant.

(5) The average weight per month of the hazardous materials being processed by the source, over the last 12 months preceding the date of the report.

(6) A description of the existing control equipment for each emission point.

(i) Primary control device(s) for each hazardous pollutant.

(ii) Secondary control device(s) for each hazardous pollutant.

(iii) Estimated control efficiency (percent) for each control device.

(7) A statement by the owner or operator of the source as to whether he can comply with the standards prescribed in this part within 90 days of the effective date.

(b) The owner or operator of an existing source unable to operate in compliance with any standard prescribed under this part may request a waiver of compliance with such standard for a period not exceeding 2 years from the effective date. Any request shall be in writing and shall include the following information:

(1) A description of the controls to be installed to comply with the standard.

(2) A compliance schedule, including the date each step toward compliance will be reached. Such list shall include as a minimum the following dates:

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(i) Date by which contracts for emission control systems or process modifications will be awarded, or date by which orders will be issued for the purchase of component parts to accomplish emission control or process modification;

(ii) Date of initiation of onsite construction or installation of emission control equipment or process change;

(iii) Date by which onsite construction or installation of emission control equipment or process modification is to be completed; and

(iv) Date by which final compliance is to be achieved.

(3) A description of interim emission control steps which will be taken during the waiver period.

(c) Changes in the information provided under paragraph (a) of this section shall be provided to the Administrator within 30 days after such change, except that if changes will result from modification of the source, as defined in § 61.02(j), the provisions of § 61.07 and § 61.08 are applicable.

(d) The format for reporting under this section is included as Appendix A of this part. Advice on reporting the status of compliance may be obtained from the Administrator.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.11 Waiver of compliance.

(a) Based on the information provided in any request under § 61.10, or other information, the Administrator may grant a waiver of compliance with a standard for a period not exceeding 2 years from the effective date of such standard.

(b) Such waiver will be in writing and will:

(1) Identify the stationary source covered.

(2) Specify the termination date of the waiver. The waiver may be terminated at an earlier date if the conditions specified under paragraph (b)(3) of this section are not met.

(3) Specify dates by which steps toward compliance are to be taken; and impose such additional conditions as the Administrator determines to be necessary to assure installation of the necessary controls within the waiver period, and to assure protection of the health of persons during the waiver period.

(c) Prior to denying any request for a waiver pursuant to this section, the Administrator will notify the owner or operator making such request of the Administrator's intention to issue such denial, together with:

(1) Notice of the information and findings on which such intended denial is based, and

(2) Notice of opportunity for such owner or operator to present, within such time limit as the Administrator specifies, additional information or arguments to the Administrator prior to final action on such request.

(d) A final determination to deny any request for a waiver will be in writing and will set forth the specific grounds on which such denial is based. Such final determination will be made within 60 days after presentation of additional information or arguments, or 60 days after the final date specified for such presentation, if no presentation is made.

(e) The granting of a waiver under this section shall not abrogate the Administrator's authority under section 114 of the act.

§ 61.12 Emission tests and monitoring.

(a) Emission tests and monitoring shall be conducted and reported as set forth in this part and Appendix B to this part.

(b) The owner or operator of a new source subject to this part, and at the request of the Administrator, the owner or operator of an existing source subject to this part, shall provide or cause to be provided, emission testing facilities as follows:

(1) Sampling ports adequate for test methods applicable to such source.

(2) Safe sampling platform(s).

(3) Safe access to sampling platform(s).

(4) Utilities for sampling and testing equipment.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.13 Waiver of emission tests.

(a) Emission tests may be waived upon written application to the Administrator if, in his judgment, the source is meeting the standard, or if the source is operating under a waiver of compliance or has requested a waiver of compliance.

(b) If application for waiver of the emission test is made, such application shall accompany the information required by § 61.10. The appropriate form is contained in Appendix A to this part.

(c) Approval of any waiver granted pursuant to this section shall not abrogate the Administrator's authority under the act or in any way prohibit the Administrator from later canceling such waiver. Such cancellation will be made only after notice is given to the owner or operator of the source.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.14 Source test and analytical methods.

(a) Methods 101, 101A, 102, and 104 in Appendix B to this part shall be used for all source tests required under this part, unless an equivalent method or an alternative method has been approved by the Administrator.

(b) Method 103 in Appendix B to this part is hereby approved by the Administrator as an alternative method for sources subject to § 61.32(a) and § 61.42(b).

(c) The Administrator may, after notice to the owner or operator, withdraw approval of an alternative method granted under paragraphs (a), (b) or (d) of this section. Where the test results using an alternative method do not adequately indicate whether a source is in compliance with a standard, the Administrator may require the use of the reference method or its equivalent.

(d) Method 105 in Appendix B to this part is hereby approved by the Administrator as an alternative method for sources subject to § 61.52(b).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48299, Oct. 14, 1975; 43 FR 8800, Mar. 3, 1978; 47 FR 24704, June 8, 1982]

§ 61.15 Availability of information.

The availability to the public of information provided to, or otherwise obtained by, the Administrator under this part shall be governed by Part 2 of this chapter.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 36918, Sept. 1, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.16 State authority.

(a) The provisions of this part shall not be construed in any manner to preclude any State or political subdivision thereof from:

(1) Adopting and enforcing any emission limiting regulation applicable to a stationary source, provided that such emission limiting regulation is not less stringent than the standards prescribed under this part.

(2) Requiring the owner or operator of a stationary source, other than a stationary source owned or operated by the United States, to obtain permits, licenses, or approvals prior to initiating construction, modification, or operation of such source.

(Sec. 116, Clean Air Act as amended (42 U.S.C. 7416))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.17 Circumvention.

No owner or operator subject to the provisions of this part shall build, erect, install, or use any article machine, equipment, process, or method, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous dilutants to achieve compliance with a visible emissions standard, and the piecemeal carrying out of an operation to avoid coverage by a standard that applies only to operations larger than a specified size.

[40 FR 48299, Oct. 14, 1975]

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Subpart B—National Emission Standard for Asbestos

§ 61.20 Applicability.

The provisions of this subpart are applicable to those sources specified in § 61.22.

§ 61.21 Definitions.

Terms used in this subpart are defined in the act, in Subpart A of this part, or in this section as follows:

(a) "Asbestos" means actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite.

(b) "Asbestos material" means asbestos or any material containing asbestos.

(c) "Particulate asbestos material" means finely divided particles of asbestos material.

(d) "Asbestos tailings" means any solid waste product of asbestos mining or milling operations which contains asbestos.

(e) "Outside air" means the air outside buildings and structures.

(f) "Visible emissions" means any emissions which are visually detectable without the aid of instruments and which contain particulate asbestos material.

(g) "Asbestos mill" means any facility engaged in the conversion of any intermediate step in the conversion of asbestos or into commercial asbestos. Outside storage of asbestos materials is not considered a part of such facility.

(h) "Commercial asbestos" means any variety of asbestos which is produced by extracting asbestos from asbestos ore.

(i) "Manufacturing" means the combining of commercial asbestos, or in the case of woven friction products the combining of textiles containing commercial asbestos, with any other material(s), including commercial asbestos, and the processing of this combination into a product as specified in § 61.22(c).

(j) "Demolition" means the wrecking or taking out of any load-supporting structural member and any related removing or stripping of friable asbestos materials.

(k) "Friable asbestos material" means any material that contains more than 1 percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder, when dry, by hand pressure.

(l) "Control device asbestos waste" means any asbestos-containing waste material that is collected in a pollution control device.

(m) "Renovation" means the removing or stripping of friable asbestos material used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member. Operations in which load-supporting structural members are wrecked or taken out are excluded.

(n) "Planned renovation" means a renovation operation, or a number of such operations, in which the amount of friable asbestos material that will be removed or stripped within a given period of time can be predicted. Operations that are individually non-scheduled are included, provided a number of such operations can be predicted to occur during a given period of time based on operating experience.

(o) "Emergency renovation" means a renovation operation that results from a sudden, unexpected event, and is not a planned renovation. Operations necessitated by non-routine failures of equipment are included.

(p) "Adequately wetted" means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

(q) "Removing" means taking out friable asbestos materials used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member from any building, structure, facility, or installation.

(r) "Stripping" means taking off friable asbestos materials from any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member.

(s) "Fabricating" means any processing of a manufactured product containing commercial asbestos, with the exception of processing at temporary sites for the construction or restoration of buildings, structures, facilities or installations.

(t) "Inactive waste disposal site" means any disposal site or portion thereof where additional asbestos-containing waste material will not be de-

posited and where the surface is not disturbed by vehicular traffic.

(u) "Active waste disposal site" means any disposal site other than an inactive site.

(v) "Roadways" means surfaces on which motor vehicles travel including, but not limited to, highways, roads, streets, parking areas, and driveways.

(w) "Asbestos-containing waste material" means any waste which contains commercial asbestos and is generated by a source subject to the provisions of this subpart, including asbestos mill tailings, control device asbestos waste, friable asbestos waste material, and bags or containers that previously contained commercial asbestos.

(x) "Structural member" means any load-supporting member, such as beams and load-supporting walls; or any non-load-supporting member, such as ceilings and non-load-supporting walls.

[38 FR 8826, Apr. 6, 1973, as amended at 39 FR 15398, May 3, 1974; 40 FR 48299, Oct. 14, 1975; 42 FR 12127, Mar. 2, 1977; 43 FR 26373, June 19, 1978]

§ 61.22 Emission standard.

(a) Asbestos mills: There shall be no visible emissions to the outside air from any asbestos mill except as provided in paragraph (f) of this section.

(b) Roadways: The surfacing of roadways with asbestos tailings or with asbestos-containing waste that is generated by any source subject to paragraphs (c), (d), (e) or (h) of this section is prohibited, except for temporary roadways on an area of asbestos ore deposits. The deposition of asbestos tailings or asbestos-containing waste on roadways covered with snow or ice is considered "surfacing."

(c) Manufacturing: There shall be no visible emissions to the outside air, except as provided in paragraph (f) of this section, from any of the following operations if they use commercial asbestos or from any building or structure in which such operations are conducted.

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.

(2) The manufacture of cement products.

(3) The manufacture of fireproofing and insulating materials.

(4) The manufacture of friction products.

(5) The manufacture of paper, millboard, and felt.

(6) The manufacture of floor tile.

(7) The manufacture of paints, coatings, caulks, adhesives, sealants.

(8) The manufacture of plastics and rubber materials.

(9) The manufacture of chlorine.

(10) The manufacture of shotgun shells.

(11) The manufacture of asphalt concrete.

(d) Demolition and renovation: The requirements of this paragraph shall apply to any owner or operator of a demolition or renovation operation who intends to demolish any institutional, commercial, or industrial building (including apartment buildings having more than four dwelling units), structure, facility, installation, or portion thereof, which contains any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member that is covered or coated with friable asbestos material, except as provided in paragraph (d)(1) of this section; or who intends to renovate any institutional, commercial, or industrial building, structure, facility, installation, or portion thereof where more than 80 meters (ca. 260 feet) of pipe covered or coated with friable asbestos material are stripped or removed, or more than 15 square meters (ca. 160 square feet) of friable asbestos material used to cover or coat any duct, boiler, tank, reactor, turbine, furnace, or structural member are stripped or removed.

(1)(i) The owner or operator of a demolition operation is exempted from the requirements of this paragraph: *Provided,* (A) the amount of friable asbestos material in the building or portion thereof to be demolished is less than 80 meters (ca. 260 feet) used on pipes, and less than 15 square meters (ca. 160 square feet) used on any duct, boiler, tank, reactor, turbine, furnace, or structural member, and (B) the notification requirements of paragraph (d)(1)(ii) are met.

(ii) Written notification shall be postmarked or delivered to the Administrator at least 20 days prior to com-

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mencement of demolition and shall include the information required by paragraph (d)(2) of this section, with the exception of the information required by paragraphs (d)(2)(iii), (vi), (vii), (viii), and (ix), and shall state the measured or estimated amount of friable asbestos materials which is present. Techniques of estimation shall be explained.

(2) Written notice of intention to demolish or renovate shall be provided to the Administrator by the owner or operator of the demolition or renovation operation. Such notice shall be postmarked or delivered to the Administrator at least 10 days prior to commencement of demolition, or as early as possible prior to commencement of emergency demolition subject to paragraph (d)(6) of this section, and as early as possible prior to commencement of renovation. Such notice shall include the following information:

(i) Name of owner or operator.

(ii) Address of owner or operator.

(iii) Description of the building, structure, facility, or installation to be demolished or renovated, including the size, age, and prior use of the structure, and the approximate amount of friable asbestos materials present.

(iv) Address or location of the building, structure, facility, or installation.

(v) Scheduled starting and completion dates of demolition or renovation.

(vi) Nature of planned demolition or renovation and method(s) to be employed.

(vii) Procedures to be employed to meet the requirements of this paragraph and paragraph (j) of this section.

(viii) The name and address or location of the waste disposal site where the friable asbestos waste will be deposited.

(ix) Name, title, and authority of the State or local governmental representative who has ordered a demolition which is subject to paragraph (d)(6) of this section.

(3)(i) For purposes of determining whether a planned renovating operation constitutes a renovation within the meaning of this paragraph, the amount of friable asbestos material to be removed or stripped shall be:

(A) For planned renovating operations involving individually nonscheduled operations, the additive amount of friable asbestos material that can be predicted will be removed or stripped at a source over the maximum period of time for which a prediction can be made. The period shall be not less than 30 days and not longer than one year.

(B) For each planned renovating operation not covered by paragraph (d)(3)(i)(A), the total amount of friable asbestos material that can be predicted will be removed or stripped at a source.

(ii) For purposes of determining whether an emergency renovating operation constitutes a renovation within the meaning of this paragraph, the amount of friable asbestos material to be removed or stripped shall be the total amount of friable asbestos material that will be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation.

(4) The following procedures shall be used to prevent emissions of particulate asbestos material to outside air:

(i) Friable asbestos materials, used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member, shall be removed from any building, structure, facility or installation subject to this paragraph. Such removal shall occur before wrecking or dismantling of any portion of such building, structure, facility, or installation that would break up the friable asbestos materials and before wrecking or dismantling of any other portion of such building, structure, facility, or installation that would preclude access to such materials for subsequent removal. Removal of friable asbestos materials used on any pipe, duct, or structural member which are encased in concrete or other similar structural material is not required prior to demolition, but such material shall be adequately wetted whenever exposed during demolition.

(ii) Friable asbestos materials used on pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members shall be adequately wetted during stripping, except as provided in

paragraphs (d)(4)(iv), (d)(4)(vi) or (d)(4)(vii) of this section.

(iii) Pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members that are covered or coated with friable asbestos materials may be taken out of any building, structure, facility, or installation subject to this paragraph as units or in sections provided the friable asbestos materials exposed during cutting or disjointing are adequately wetted during the cutting or disjointing operation. Such units shall not be dropped or thrown to the ground, but shall be carefully lowered to ground level.

(iv) The stripping of friable asbestos materials used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member that has been removed as a unit or in sections as provided in paragraph (d)(4)(iii) of this section shall be performed in accordance with paragraph (d)(4)(ii) of this section. Rather than comply with the wetting requirement, a local exhaust ventilation and collection system may be used to prevent emissions to the outside air. Such local exhaust ventilation systems shall be designed and operated to capture the asbestos particulate matter produced by the stripping of friable asbestos material. There shall be no visible emissions to the outside air from such local exhaust ventilation and collection systems except as provided in paragraph (f) of this section.

(v) All friable asbestos materials that have been removed or stripped shall be adequately wetted to ensure that such materials remain wet during all remaining stages of demolition or renovation and related handling operations. Such materials shall not be dropped or thrown to the ground or a lower floor. Such materials that have been removed or stripped more than 50 feet above ground level, except those materials removed as units or in sections, shall be transported to the ground via dust-tight chutes or containers.

(vi) Except as specified below, the wetting requirements of this paragraph are suspended when the temperature at the point of wetting is below 0°C (32°F). When friable asbestos materials are not wetted due to freezing temperatures, such materials on pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members shall, to the maximum extent possible, be removed as units or in sections prior to wrecking. In no case shall the requirements of paragraphs (d)(4)(iv) or (d)(4)(v) be suspended due to freezing temperatures.

(vii) For renovation operations, local exhaust ventilation and collection systems may be used, instead of wetting as specified in paragraph (d)(4)(ii), to prevent emissions of particulate asbestos material to outside air when damage to equipment resulting from the wetting would be unavoidable. Upon request and supply of adequate information, the Administrator will determine whether damage to equipment resulting from wetting to comply with the provisions of this paragraph would be unavoidable. Such local exhaust ventilation systems shall be designed and operated to capture the asbestos particulate matter produced by the stripping and removal of friable asbestos material. There shall be no visible emissions to the outside air from such local exhaust ventilation and collection systems, except as provided in paragraph (f) of this section.

(5) Sources subject to this paragraph are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

(6) The demolition of a building, structure, facility, or installation, pursuant to an order of an authorized representative of a State or local governmental agency, issued because that building is structurally unsound and in danger of imminent collapse is exempt from all but the following requirements of paragraph (d) of this section:

(i) The notification requirements specified by paragraph (d)(2) of this section;

(ii) The requirements on stripping of friable asbestos materials from previously removed units or sections as specified in paragraph (d)(4)(iv) of this section;

(iii) The wetting, as specified by paragraph (d)(4)(v) of this section, of friable asbestos materials that have been removed or stripped;

(iv) The portion of the structure being demolished that contains friable

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asbestos materials shall be adequately wetted during the wrecking operation.

(e) Spraying: There shall be no visible emissions to the outside air from the spray-on application of materials containing more than 1 percent asbestos, on a dry weight basis, used on equipment and machinery, except as provided in paragraph (f) of this section. Materials sprayed on buildings, structures, pipes, and conduits shall contain less than 1 percent asbestos on a dry weight basis.

(1) Sources subject to this paragraph are exempt from the requirements of § 61.05(a), § 61.07, and § 61.09.

(2) Any owner or operator who intends to spray asbestos materials which contain more than 1 percent asbestos on a dry weight basis to insulate or fireproof equipment and machinery shall report such intention to the Administrator at least 20 days prior to the commencement of the spraying operation. Such report shall include the following information:

(i) Name of owner or operator.

(ii) Address of owner or operator.

(iii) Location of spraying operation.

(iv) Procedures to be followed to meet the requirements of this paragraph.

(3) The spray-on application of materials in which the asbestos fibers are encapsulated with a bituminous or resinous binder during spraying and which are not friable after drying is exempted from the requirements of paragraphs (e) and (e)(2) of this section.

(f) Rather than meet the no-visible-emission requirements as specified by paragraphs (a), (c), (d), (e), (h), (j), and (k) of this section, an owner or operator may elect to use the methods specified by § 61.23 to clean emissions containing particulate asbestos material before such emissions escape to, or are vented to, the outside air.

(g) Where the presence of uncombined water is the sole reason for failure to meet the no-visible-emission requirement of paragraphs (a), (c), (d), (e), (h), (j), or (k) of this section, such failure shall not be a violation of such emission requirements.

(h) Fabricating: There shall be no visible emissions to the outside air, except as provided in paragraph (f) of this section, from any of the following operations if they use commercial asbestos or from any building or structure in which such operations are conducted.

(1) The fabrication of cement building products.

(2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

(3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture; bulkheads, partitions and ceilings for marine construction; and flow control devices for the molten metal industry.

(i) Insulating: Molded insulating materials which are friable and wet-applied insulating materials which are friable after drying, installed after the effective date of these regulations, shall contain no commercial asbestos. The provisions of this paragraph do not apply to insulating materials which are spray applied; such materials are regulated under § 61.22(e).

(j) Waste disposal for manufacturing, fabricating, demolition, renovation and spraying operations: The owner or operator of any source covered under the provisions of paragraphs (c), (d), (e), or (h) of this section shall meet the following standards:

(1) There shall be no visible emissions to the outside air, except as provided in paragraph (j)(3) of this section, during the collection; processing, including incineration; packaging; transporting; or deposition of any asbestos-containing waste material which is generated by such source.

(2) All asbestos-containing waste material shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(3) Rather than meet the requirement of paragraph (j)(1) of this section, an owner or operator may elect to use either of the disposal methods specified under (j)(3) (i) and (ii) of this section, or an alternative disposal method which has received prior approval by the Administrator:

(i) Treatment of asbestos-containing waste material with water:

(A) Control device asbestos waste shall be thoroughly mixed with water into a slurry and other asbestos-containing waste material shall be adequately wetted. There shall be no visible emissions to the outside air from the collection, mixing and wetting operations, except as provided in paragraph (f) of this section.

(B) After wetting, all asbestos-containing waste material shall be sealed into leak-tight containers while wet, and such containers shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(C) The containers specified under paragraph (j)(3)(i)(B) of this section shall be labeled with a warning label that states:

CAUTION

Contains Asbestos

Avoid Opening or

Breaking Container

Breathing Asbestos is Hazardous

to Your Health

Alternatively, warning labels specified by Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.93a(g)(2)(ii) may be used.

(ii) Processing of asbestos-containing waste material into non-friable forms:

(A) All asbestos-containing waste material shall be formed into non-friable pellets or other shapes and deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(B) There shall be no visible emissions to the outside air from the collection and processing of asbestos-containing waste material, except as specified in paragraph (f) of this section.

(4) For the purposes of this paragraph (j), the term all asbestos-containing waste material as applied to demolition and renovation operations covered by paragraph (d) of this section includes only friable asbestos waste and control device asbestos waste.

(k) Waste disposal for asbestos mills: The owner or operator of any source covered under the provisions of paragraph (a) of this section shall meet the following standard:

(1) There shall be no visible emissions to the outside air, except as provided in paragraph (k)(3) of this section, during the collection, processing, packaging, transporting or deposition of any asbestos-containing waste material which is generated by such source.

(2) All asbestos-containing waste material shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(3) Rather than meet the requirement of paragraph (k)(1) of this section, an owner or operator may elect to meet the following requirements in paragraphs (k)(3) (i) and (ii), or use an alternative disposal method which has received prior approval by the Administrator:

(i) There shall be no visible emissions to the outside air from the transfer of control device asbestos waste to the tailings conveyor, except as provided in paragraph (f) of this section. Such waste shall be subsequently processed either as specified in paragraph (k)(3)(ii) of this section or as specified in paragraph (j)(3) of this section.

(ii) All asbestos-containing waste material shall be adequately mixed, with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, prior to deposition at a waste disposal site. Such agent shall be used as recommended for the particular dust by the manufacturer of the agent. There shall be no discharge of visible emissions to the outside air from the wetting operation except as specified in paragraph (f) of this section. Wetting may be suspended when the ambient temperature at the waste disposal site is less than −9.5° C (ca. 15° F). The ambient air temperature shall be determined by an appropriate measurement method with an accuracy of ±1° C (±2° F) and recorded at least at hourly intervals during the period that the operation of the wetting system is suspended. Records of such temperature measurements shall be retained at the source for a minimum of 2 years and made available for inspection by the Administrator.

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(l) The owner of any inactive waste disposal site, which was operated by sources covered under § 61.22(a), (c) or (h) and where asbestos-containing waste material produced by such sources was deposited, shall meet the following standards:

(1) There shall be no visible emissions to the outside air from an inactive waste disposal site subject to this paragraph, except as provided in paragraph (l)(5) of this section.

(2) Warning signs shall be displayed at all entrances, and along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited, at intervals of 100 m (ca. 330 ft) or less, except as specified in paragraph (l)(4) of this section. Signs shall be posted in such a manner and location that a person may easily read the legend. The warning signs required by this paragraph shall conform to the requirements of 20" x 14" upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

LEGEND

ASBESTOS WASTE DISPOSAL SITE

DO NOT CREATE DUST

Breathing Asbestos is Hazardous to Your Health

Notation

1" Sans Serif, Gothic or Block

¾" Sans Serif, Gothic or Block

14 Point Gothic

Spacing between lines shall be at least equal to the height of the upper of the two lines.

(3) The perimeter of the site shall be fenced in a manner adequate to deter access by the general public, except as specified in paragraph (l)(4) of this section.

(4) Warning signs and fencing are not required where the requirements of paragraphs (l)(5) (i) or (ii) of this section are met, or where a natural barrier adequately deters access by the general public. Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access to the general public.

(5) Rather than meet the requirement of paragraph (1)(l) of this section, an owner may elect to meet the requirements of this paragraph or may use an alternative control method for emissions from inactive waste disposal sites which has received prior approval by the Administrator.

(i) The asbestos-containing waste material shall be covered with at least 15 centimeters (ca. 6 inches) of compacted non-asbestos-containing material, and a cover of vegetation shall be grown and maintained on the area adequate to prevent exposure of the asbestos-containing waste material; or

(ii) The asbestos-containing waste material shall be covered with at least 60 centimeters (ca. 2 feet) of compacted non-asbestos-containing material and maintained to prevent exposure of the asbestos-containing waste; or

(iii) For inactive waste disposal sites for asbestos tailings, a resinous or petroleum-based dust suppression agent which effectively binds dust and controls wind erosion shall be applied. Such agent shall be used as recommended for the particular asbestos tailings by the dust suppression agent manufacturer. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

[38 FR 8826, Apr. 6, 1973, as amended at 39 FR 15398, May 3, 1974; 40 FR 48299, Oct. 14, 1975; 43 FR 26374, June 19, 1978]

§ 61.23 Air-cleaning.

If air-cleaning is elected, as permitted by §§ 61.22(f) and 61.22(d)(4)(iv), the requirements of this section must be met.

(a) Fabric filter collection devices must be used, except as noted in paragraphs (b) and (c) of this section. Such devices must be operated at a pressure drop of no more than 4 inches water gage, as measured across the filter fabric. The airflow permeability, as determined by ASTM method D737-69, must not exceed 30 $ft^3/min/ft^2$ for

woven fabrics or 35 $ft^3/min/ft^2$ for felted fabrics, except that 40 $ft^3/min/ft^2$ for woven and 45 $ft^3/min/ft^2$ for felted fabrics is allowed for filtering air from asbestos ore dryers. Each square yard of felted fabric must weigh at least 14 ounces and be at least one-sixteenth inch thick throughout. Synthetic fabrics must not contain fill yarn other than that which is spun.

(b) If the use of fabric filters creates a fire or explosion hazard, the administrator may authorize the use of wet collectors designed to operate with a unit contacting energy of at least 40 inches water gage pressure.

(c) The administrator may authorize the use of filtering equipment other than that described in paragraphs (a) and (b) of this section if the owner or operator demonstrates to the satisfaction of the administrator that the filtering of particulate asbestos material is equivalent to that of the described equipment.

(d) All air-cleaning equipment authorized by this section must be properly installed, used, operated, and maintained. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the particulate asbestos material.

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48302, Oct. 14, 1975]

§ 61.24 Reporting.

The owner or operator of any existing source to which this subpart is applicable shall, within 90 days after the effective date, provide the following information to the administrator:

(a) A description of the emission control equipment used for each process;

(b) If a fabric filter device is used to control emissions, the pressure drop across the fabric filter in inches water gage.

(1) If the fabric filter device utilizes a woven fabric, the airflow permeability in $ft^3/min/ft^2$ and, if the fabric is synthetic, indicate whether the fill yarn is spun or not spun.

(2) If the fabric filter device utilizes a felted fabric, the density in oz/yd^2, the minimum thickness in inches, and the airflow permeability in $ft^3/min/ft^2$.

(c) For sources subject to §§ 61.22(j) and 61.22(k):

(1) A brief description of each process that generates asbestos-containing waste material.

(2) The average weight of asbestos-containing waste material disposed of, measured in kg/day.

(3) The emission control methods used in all stages of waste disposal.

(4) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.

(d) For sources subject to § 61.22(l):

(1) A brief description of the site.

(2) The method or methods used to comply with the standard, or alternative procedures to be used.

(e) Such information shall accompany the information required by § 61.10. The information described in this section shall be reported using the format of Appendix A of this part.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48302, Oct. 14, 1975; 43 FR 8800, Mar. 3, 1978]

§ 61.25 Waste disposal sites.

In order to be an acceptable site for disposal of asbestos-containing waste material under § 61.22(j) and (k), an active waste disposal site shall meet the requirements of this section.

(a) There shall be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, except as provided in paragraph (e) of this section.

(b) Warning signs shall be displayed at all entrances, and along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited, at intervals of 100 m (ca. 330 ft) or less except as specified in paragraph (d) of this section. Signs shall be posted in such a manner and location that a person may easily read the legend. The warning signs required by this paragraph shall conform to the requirements of 20" × 14" upright format signs specified in 29

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CFR 1910.145(d)(4) and this paragraph. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

LEGEND

ASBESTOS WASTE DISPOSAL SITE

Do Not Create Dust

Breathing Asbestos is Hazardous to Your Health

Notation

1" Sans Serif, Gothic or Block

¾" Sans Serif, Gothic or Block

14 Point Gothic

Spacing between lines shall be at least equal to the height of the upper of the two lines.

(c) The perimeter of the disposal site shall be fenced in order to adequately deter access to the general public except as specified in paragraph (d) of this section.

(d) Warning signs and fencing are not required where the requirements of paragraph (e)(1) of this section are met, or where a natural barrier adequately deters access to the general public. Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access to the general public.

(e) Rather than meet the requirement of paragraph (a) of this section, an owner or operator may elect to meet the requirements of paragraph (e)(1) or (e)(2) of this section, or may use an alternative control method for emissions from active waste disposal sites which has received prior approval by the Administrator.

(1) At the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period shall be covered with at least 15 centimeters (ca. 6 inches) of compacted non-asbestos-containing material.

(2) At the end of each operating day, or at least once every 24-hour period while the disposal site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period shall be covered with a resinous or petroleum-based dust suppression agent which effectively binds dust and controls wind erosion. Such agent shall be used as recommended for the particular dust by the dust suppression agent manufacturer. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

[40 FR 48302, Oct. 14, 1975]

Subpart C—National Emission Standard for Beryllium

§ 61.30 Applicability.

The provisions of this subpart are applicable to the following stationary sources:

(a) Extraction plans, ceramic plants, foundries, incinerators, and propellant plants which process beryllium ore, beryllium, beryllium oxide, beryllium alloys, or beryllium-containing waste.

(b) Machine shops which process beryllium, beryllium oxides, or any alloy when such alloy contains more than 5 percent beryllium by weight.

§ 61.31 Definitions.

Terms used in this subpart are defined in the act, in subpart A of this part, or in this section as follows:

(a) "Beryllium" means the element beryllium. Where weights or concentrations are specified, such weights or concentrations apply to beryllium only, excluding the weight or concentration of any associated elements.

(b) "Extraction plant" means a facility chemically processing beryllium ore to beryllium metal, alloy, or oxide, or performing any of the intermediate steps in these processes.

(c) "Beryllium ore" means any naturally occurring material mined or gathered for its beryllium content.

(d) "Machine shop" means a facility performing cutting, grinding, turning, honing, milling, deburring, lapping,

electrochemical machining, etching, or other similar operations.

(e) "Ceramic plant" means a manufacturing plant producing ceramic items.

(f) "Foundry" means a facility engaged in the melting or casting of beryllium metal or alloy.

(g) "Beryllium-containing waste" means material contaminated with beryllium and/or beryllium compounds used or generated during any process or operation performed by a source subject to this subpart.

(h) "Incinerator" means any furnace used in the process of burning waste for the primary purpose of reducing the volume of the waste by removing combustible matter.

(i) "Propellant" means a fuel and oxidizer physically or chemically combined which undergoes combustion to provide rocket propulsion.

(j) "Beryllium alloy" means any metal to which beryllium has been added in order to increase its beryllium content and which contains more than 0.1 percent beryllium by weight.

(k) "Propellant plant" means any facility engaged in the mixing, casting, or machining of propellant.

§ 61.32 Emission standard.

(a) Emissions to the atmosphere from stationary sources subject to the provisions of this subpart shall not exceed 10 grams of beryllium over a 24-hour period, except as provided in paragraph (b) of this section.

(b) Rather than meet the requirement of paragraph (a) of this section, an owner or operator may request approval from the Administrator to meet an ambient concentration limit on beryllium in the vicinity of the stationary source of 0.01 $\mu g/m^3$, averaged over a 30-day period.

(1) Approval of such requests may be granted by the Administrator provided that:

(i) At least 3 years of data is available which in the judgment of the Administrator demonstrates that the future ambient concentrations of beryllium in the vicinity of the stationary source will not exceed 0.01 $\mu g/m^3$, averaged over a 30-day period. Such 3-year period shall be the 3 years ending 30 days before the effective date of this standard.

(ii) The owner or operator requests such approval in writing within 30 days after the effective date of this standard.

(iii) The owner or operator submits a report to the Administrator within 45 days after the effective date of this standard which report includes the following information:

(*a*) Description of sampling method including the method and frequency of calibration.

(*b*) Method of sample analysis.

(*c*) Averaging technique for determining 30-day average concentrations.

(*d*) Number, identity, and location (address, coordinates, or distance and heading from plant) of sampling sites.

(*e*) Ground elevations and height above ground of sampling inlets.

(*f*) Plant and sampling area plots showing emission points and sampling sites. Topographic features significantly affecting dispersion including plant building heights and locations shall be included.

(*g*) Information necessary for estimating dispersion including stack height, inside diameter, exit gas temperature, exit velocity or flow rate, and beryllium concentration.

(*h*) A description of data and procedures (methods or models) used to design the air sampling network (i.e., number and location of sampling sites).

(*i*) Air sampling data indicating beryllium concentrations in the vicinity of the stationary source for the 3-year period specified in paragraph (b)(1) of this section. This data shall be presented chronologically and include the beryllium concentration and location of each individual sample taken by the network and the corresponding 30-day average beryllium concentrations.

(2) Within 60 days after receiving such report, the Administrator will notify the owner or operator in writing whether approval is granted or denied. Prior to denying approval to comply with the provisions of paragraph (b) of this section, the Administrator will consult with representatives of the statutory source for which the demonstration report was submitted.

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(c) The burning of beryllium and/or beryllium-containing waste, except propellants, is prohibited except in incinerators, emissions from which must comply with the standard.

§ 61.33 Stack sampling.

(a) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator required to comply with § 61.32(a) shall test emissions from his source,

(1) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(2) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(b) The Administrator shall be notified at least 30 days prior to an emission test so that he may at his option observe the test.

(c) Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which will occur in any 24-hour period. Where emissions depend upon the relative frequency of operation of different types of processes, operating hours, operating capacities, or other factors, the calculation of maximum 24-hour-period emissions will be based on that combination of factors which is likely to occur during the subject period and which result in the maximum emissions. No changes in the operation shall be made, which would potentially increase emissions above that determined by the most recent source test, until a new emission level has been estimated by calculation and the results reported to the Administrator.

(d) All samples shall be analyzed and beryllium emissions shall be determined within 30 days after the source test. All determinations shall be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determination.

(e) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.34 Air sampling.

(a) Stationary sources subject to § 61.32(b) shall locate air sampling sites in accordance with a plan approved by the Administrator. Such sites shall be located in such a manner as is calculated to detect maximum concentrations of beryllium in the ambient air.

(b) All monitoring sites shall be operated continuously except for a reasonable time allowance for instrument maintenance and calibration, for changing filters, or for replacement of equipment needing major repair.

(c) Filters shall be analyzed and concentrations calculated within 30 days after filters are collected. Records of concentrations at all sampling sites and other data needed to determine such concentrations shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(d) Concentrations measured at all sampling sites shall be reported to the Administrator every 30 days by a registered letter.

(e) The Administrator may at any time require changes in, or expansion of, the sampling network.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart D—National Emission Standard for Beryllium Rocket Motor Firing

§ 61.40 Applicability.

The provisions of this subpart are applicable to rocket motor test sites.

§ 61.41 Definitions.

Terms used in this subpart are defined in the Act, in Subpart A of this part, or in this section as follows:

(a) "Rocket motor test site" means any building, structure, facility, or in-

stallation where the static test firing of a beryllium rocket motor and/or the disposal of beryllium propellant is conducted.

(b) "Beryllium propellant" means any propellant incorporating beryllium.

§ 61.42 Emission standard.

(a) Emissions to the atmosphere from rocket-motor test sites shall not cause time-weighted atmospheric concentrations of beryllium to exceed 75 microgram minutes per cubic meter of air within the limits of 10 to 60 minutes, accumulated during any 2 consecutive weeks, in any area in which an effect adverse to public health could occur.

(b) If combustion products from the firing of beryllium propellant are collected in a closed tank, emissions from such tank shall not exceed 2 grams per hour and a maximum of 10 grams per day.

§ 61.43 Emission testing—rocket firing or propellant disposal.

(a) Ambient air concentrations shall be measured during and after firing of a rocket motor or propellant disposal and in such a manner that the effect of these emissions can be compared with the standard. Such sampling techniques shall be approved by the Administrator.

(b) All samples shall be analyzed and results shall be calculated within 30 days after samples are taken and before any subsequent rocket motor firing or propellant disposal at the given site. All results shall be reported to the Administrator by a registered letter dispatched before the close of the next business day following determination of such results.

(c) Records of air sampling test results and other data needed to determine integrated intermittent concentrations shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(d) The Administrator shall be notified at least 30 days prior to an air sampling test, so that he may at his option observe the test.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.44 Stack sampling.

(a) Sources subject to § 61.42(b) shall be continuously sampled, during release of combustion products from the tank, in such a manner that compliance with the standards can be determined. The provisions of § 61.14 shall apply.

(b) All samples shall be analyzed, and beryllium emissions shall be determined within 30 days after samples are taken and before any subsequent rocket motor firing or propellant disposal at the given site. All determinations shall be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determinations.

(c) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(d) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart E—National Emission Standard for Mercury

§ 61.50 Applicability.

The provisions of this subpart are applicable to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge.

[40 FR 48302, Oct. 14, 1975]

§ 61.51 Definitions.

Terms used in this subpart are defined in the act, in Subpart A of this part, or in this section as follows:

(a) "Mercury" means the element mercury, excluding any associated elements, and includes mercury in partic-

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ulates, vapors, aerosols, and compounds.

(b) "Mercury ore" means a mineral mined specifically for its mercury content.

(c) "Mercury ore processing facility" means a facility processing mercury ore to obtain mercury.

(d) "Condenser stack gases" mean the gaseous effluent evolved from the stack of processes utilizing heat to extract mercury metal from mercury ore.

(e) "Mercury chlor-alkali cell" means a device which is basically composed of an electrolyzer section and a denuder (decomposer) section and utilizes mercury to produce chlorine gas, hydrogen gas, and alkali metal hydroxide.

(f) "Mercury chlor-alkali electrolyzer" means an electrolytic device which is part of a mercury chlor-alkali cell and utilizes a flowing mercury cathode to produce chlorine gas and alkali metal amalgam.

(g) "Denuder" means a horizontal or vertical container which is part of a mercury chlor-alkali cell and in which water and alkali metal amalgam are converted to alkali metal hydroxide, mercury, and hydrogen gas in a short-circuited, electrolytic reaction.

(h) "Hydrogen gas stream" means a hydrogen stream formed in the chlor-alkali cell denuder.

(i) "End box" means a container(s) located on one or both ends of a mercury chlor-alkali electrolyzer which serves as a connection between the electrolyzer and denuder for rich and stripped amalgam.

(j) "End box ventilation system" means a ventilation system which collects mercury emissions from the end-boxes, the mercury pump sumps, and their water collection systems.

(k) "Cell room" means a structure(s) housing one or more mercury electrolytic chlor-alkali cells.

(l) "Sludge" means sludge produced by a treatment plant that processes municipal or industrial waste waters.

(m) "Sludge dryer" means a device used to reduce the moisture content of sludge by heating to temperatures above 65°C (ca. 150°F) directly with combustion gases.

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48302, Oct. 14, 1975]

§ 61.52 Emission standard.

(a) Emissions to the atmosphere from mercury ore processing facilities and mercury cell chlor-alkali plants shall not exceed 2300 grams of mercury per 24-hour period.

(b) Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period.

[40 FR 48302, Oct. 14, 1975]

§ 61.53 Stack sampling.

(a) Mercury ore processing facility.

(1) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator processing mercury ore shall test emissions from his source:

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial start-up date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(2) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(3) Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which will occur in a 24-hour period. No changes in the operation shall be made, which would potentially increase emissions above that determined by the most recent source test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(4) All samples shall be analyzed, and mercury emissions shall be determined within 30 days after the source test. Each determination will be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determination.

(5) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspec-

tion by the Administrator, for a minimum of 2 years.

(b) Mercury chlor-alkali plant—hydrogen and end-box ventilation gas streams.

(1) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator employing mercury chlor-alkali cell(s) shall test emissions from his source.

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(2) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(3) Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which will occur in a 24-hour period. No changes in the operation shall be made, which would potentially increase emissions above that determined by the most recent source test, until the new emission has been estimated by calculation and the results reported to the Administrator.

(4) All samples shall be analyzed and mercury emissions shall be determined within 30 days after the source test. All the determinations will be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determination.

(5) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(c) Mercury chlor-alkali plants—cell room ventilation system.

(1) Stationary sources using mercury chlor-alkali cells may test cell room emissions in accordance with paragraph (c)(2) of this section or demonstrate compliance with paragraph (c)(4) of this section and assume ventilation emissions of 1,300 gms/day of mercury.

(2) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator shall pass all cell room air in forced gas streams through stacks suitable for testing.

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(3) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(4) An owner or operator may carry out approved design, maintenance, and housekeeping practices. A list of approved design, maintenance, and housekeeping practices may be obtained from the Administrator.

(d) Sludge incineration and drying plants.

(1) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator of a source subject to the standard in § 61.52(b) shall test emissions from that source. Such tests shall be conducted in accordance with the procedures set forth either in paragraph (d) of this section or in § 61.54.

(2) Method 101A in Appendix B to this part shall be used to test emissions as follows:

(i) The test shall be performed within 90 days of the effective date of these regulations in the case of an existing source or a new source which has an initial startup date preceding the effective date.

(ii) The test shall be performed within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(3) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(4) Samples shall be taken over such a period or periods as are necessary to determine accurately the maximum emissions which will occur in a 24-hour period. No changes shall be made in the operation which would poten-

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tially increase emissions above the level determined by the most recent stack test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(5) All samples shall be analyzed, and mercury emissions shall be determined within 30 days after the stack test. Each determination shall be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determination.

(6) Records of emission test results and other data needed to determine total emissions shall be retained at the source and shall be made available, for inspection by the Administrator, for a minimum of 2 years.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48302, Oct. 14, 1975; 43 FR 8800, Mar. 3, 1978; 47 FR 24704, June 8, 1982]

§ 61.54 Sludge sampling.

(a) As an alternative means for demonstrating compliance with § 61.52(b), an owner or operator may use Method 105 of Appendix B and the procedures specified in this section.

(1) A sludge test shall be conducted within 90 days of the effective date of these regulations in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(2) A sludge test shall be conducted within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(b) The Administrator shall be notified at least 30 days prior to a sludge sampling test, so that he may at his option observe the test.

(c) Sludge shall be sampled according to paragraph (c)(1) of this section, sludge charging rate for the plant shall be determined according to paragraph (c)(2) of this section, and the sludge analysis shall be performed according to paragraph (c)(3) of this section.

(1) The sludge shall be sampled after dewatering and before incineration or drying, at a location that provides a representative sample of the sludge that is charged to the incinerator or dryer. Eight consecutive grab samples shall be obtained at intervals of between 45 and 60 minutes and thoroughly mixed into one sample. Each of the eight grab samples shall have a volume of at least 200 ml but not more than 400 ml. A total of three composite samples shall be obtained within an operating period of 24 hours. When the 24-hour operating period is not continuous, the total sampling period shall not exceed 72 hours after the first grab sample is obtained. Samples shall not be exposed to any condition that may result in mercury contamination or loss.

(2) The maximum 24-hour period sludge incineration or drying rate shall be determined by use of a flow rate measurement device that can measure the mass rate of sludge charged to the incinerator or dryer with an accuracy of ±5 percent over its operating range. Other methods of measuring sludge mass charging rates may be used if they have received prior approval by the Administrator.

(3) The handling, preparation, and analysis of sludge samples shall be accomplished according to Method 105 in Appendix B of this part.

(d) The mercury emissions shall be determined by use of the following equation:

$$E_{Hg} = 1 \times 10^{-3} cQ$$

where:

E_{Hg} = Mercury emissions, g/day.
c = Mercury concentration of sludge on a dry solids basis, μg/g (ppm).
Q = Sludge charging rate, kg/day.

(e) No changes in the operation of a plant shall be made after a sludge test has been conducted which would potentially increase emissions above the level determined by the most recent sludge test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(f) All sludge samples shall be analyzed for mercury content within 30 days after the sludge sample is collected. Each determination shall be reported to the Administrator by a registered letter dispatched before the

close of the next business day following such determination.

(g) Records of sludge sampling, charging rate determination and other data needed to determine mercury content of wastewater treatment plant sludges shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 48303, Oct. 14, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.55 Emission monitoring.

(a) Wastewater treatment plant sludge incineration and drying plants. All such sources for which mercury emissions exceed 1600 g/day, demonstrated either by stack sampling according to § 61.53 or sludge sampling according to § 61.54, shall monitor mercury emissions at intervals of at least once per year by use of Method 105 of Appendix B, or the procedures specified in § 61.54 (c) and (d). The results of monitoring shall be reported and retained according to § 61.53(d) (5) and (6), or § 61.54 (f) and (g).

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 48303, Oct. 14, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

Subpart F—National Emission Standard for Vinyl Chloride

SOURCE: 41 FR 46564, Oct. 21, 1976, unless otherwise noted.

§ 61.60 Applicability.

(a) This subpart applies to plants which produce:

(1) Ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene,

(2) Vinyl chloride by any process, and/or

(3) One or more polymers containing any fraction of polymerized vinyl chloride.

(b) This subpart does not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of no more than 0.19 m^3 (50 gal).

(c) Sections of this subpart other than §§ 61.61; 61.64 (a)(1), (b), (c), and (d); 61.67; 61.68; 61.69; 61.70; and 61.71 do not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of greater than 0.19 m^3 (50 gal) and no more than 4.07 m^3 (1100 gal).

[41 FR 46564, Oct. 21, 1976, as amended at 42 FR 29006, June 7, 1977]

§ 61.61 Definitions.

Terms used in this subpart are defined in the Act, in Subpart A of this part, or in this section as follows:

(a) "Ethylene dichloride plant" includes any plant which produces ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene.

(b) "Vinyl chloride plant" includes any plant which produces vinyl chloride by any process.

(c) "Polyvinyl chloride plant" includes any plant where vinyl chloride alone or in combination with other materials is polymerized.

(d) "Slip gauge" means a gauge which has a probe that moves through the gas/liquid interface in a storage or transfer vessel and indicates the level of vinyl chloride in the vessel by the physical state of the material the gauge discharges.

(e) "Type of resin" means the broad classification of resin referring to the basic manufacturing process for producing that resin, including, but not limited to, the suspension, dispersion, latex, bulk, and solution processes.

(f) "Grade of resin" means the subdivision of resin classification which describes it as a unique resin, i.e., the most exact description of a resin with no further subdivision.

(g) "Dispersion resin" means a resin manufactured in such a way as to form fluid dispersions when dispersed in a plasticizer or plasticizer/diluent mixtures.

(h) "Latex resin" means a resin which is produced by a polymerization process which initiates from free radical catalyst sites and is sold undried.

(i) "Bulk resin" means a resin which is produced by a polymerization process in which no water is used.

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(j) "Inprocess wastewater" means any water which, during manufacturing or processing, comes into direct contact with vinyl chloride or polyvinyl chloride or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product containing vinyl chloride or polyvinyl chloride but which has not been discharged to a wastewater treatment process or discharged untreated as wastewater.

(k) "Wastewater treatment process" includes any process which modifies characteristics such as BOD, COD, TSS, and pH, usually for the purpose of meeting effluent guidelines and standards; it does not include any process the purpose of which is to remove vinyl chloride from water to meet requirements of this subpart.

(l) "In vinyl chloride service" means that a piece of equipment contains or contacts either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride.

(m) "Standard operating procedure" means a formal written procedure officially adopted by the plant owner or operator and available on a routine basis to those persons responsible for carrying out the procedure.

(n) "Run" means the net period of time during which an emission sample is collected.

(o) "Ethylene dichloride purification" includes any part of the process of ethylene dichloride production which follows ethylene dichloride formation and in which finished ethylene dichloride is produced.

(p) "Vinyl chloride purification" includes any part of the process of vinyl chloride production which follows vinyl chloride formation and in which finished vinyl chloride is produced.

(q) "Reactor" includes any vessel in which vinyl chloride is partially or totally polymerized into polyvinyl chloride.

(r) "Reactor opening loss" means the emissions of vinyl chloride occurring when a reactor is vented to the atmosphere for any purpose other than an emergency relief discharge as defined in § 61.65(a).

(s) "Stripper" includes any vessel in which residual vinyl chloride is removed from polyvinyl chloride resin, except bulk resin, in the slurry form by the use of heat and/or vacuum. In the case of bulk resin, stripper includes any vessel which is used to remove residual vinyl chloride from polyvinyl chloride resin immediately following the polymerization step in the plant process flow.

(t) "Standard temperature" means a temperature of 20° C (69° F).

(u) "Standard pressure" means a pressure of 760 mm of Hg (29.92 in. of Hg).

[41 FR 46564, Oct. 21, 1976, as amended at 42 FR 29006, June 7, 1977]

§ 61.62 Emission standard for ethylene dichloride plants.

(a) Ethylene dichloride purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in ethylene dichloride purification is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(b) Oxychlorination reactor: Except as provided in § 61.65(a), emissions of vinyl chloride to the atmosphere from each oxychlorination reactor are not to exceed 0.2g/kg (0.0002 lb/lb) of the 100 percent ethylene dichloride product from the oxychlorination process.

[42 FR 29006, June 7, 1977]

§ 61.63 Emission standard for vinyl chloride plants.

An owner or operator of a vinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) Vinyl chloride formation and purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in vinyl chloride formation and/or purification is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirment in § 61.65(b)(6)(i) before being opened.

§ 61.64 Emission standard for polyvinyl chloride plants.

An owner or operator of a polyvinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) *Reactor.* The following requirements apply to reactors:

(1) The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each reactor is not to exceed 10 ppm, except as provided in paragraph (a)(2) of this section and § 61.65(a).

(2) The reactor opening loss from each reactor is not to exceed 0.02 g vinyl chloride/kg (0.00002 lb vinyl chloride/lb) of polyvinyl chloride product, with the product determined on a dry solids basis. This requirement applies to any vessel which is used as a reactor or as both a reactor and a stripper. In the bulk process, the product means the gross product of prepolymerization and postpolymerization.

(3) Manual vent valve discharge: Except for an emergency manual vent valve discharge, there is to be no discharge to the atmosphere from any manual vent valve on a polyvinyl chloride reactor in vinyl chloride service. An emergency manual vent valve discharge means a discharge to the atmosphere which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any discharge to the atmosphere from any manual vent valve, the owner or operator of the source from which the discharge occurs shall submit to the Administrator a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, the approximate total vinyl chloride loss during the discharge, the method used for determining the vinyl chloride loss, the action that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(b) *Stripper.* The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each stripper is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(c) *Mixing, weighing, and holding containers.* The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each mixing, weighing, or holding container in vinyl chloride service which precedes the stripper (or the reactor if the plant has no stripper) in the plant process flow is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(d) *Monomer recovery system.* The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each monomer recovery system is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(e) *Sources following the stripper(s).* The following requirements apply to emissions of vinyl chloride to the atmosphere from the combination of all sources following the stripper(s) [or the reactor(s) if the plant has no stripper(s)] in the plant process flow including but not limited to, centrifuges, concentrators, blend tanks, filters, dryers, conveyor air discharges, baggers, storage containers, and inprocess wastewater:

(1) In polyvinyl chloride plants using stripping technology to control vinyl chloride emissions, the weighted average residual vinyl chloride concentration in all grades of polyvinyl chloride resin processed through the stripping operation on each calendar day, measured immediately after the stripping operation is completed, may not exceed:

(i) 2000 ppm for polyvinyl chloride dispersion resins, excluding latex resins;

(ii) 400 ppm for all other polyvinyl chloride resins, including latex resins, averaged separately for each type of resin; or

(2) In polyvinyl chloride plants controlling vinyl chloride emissions with technology other than stripping or in addition to stripping, emissions of vinyl chloride to the atmosphere may not exceed:

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(i) 2 g/kg (0.002 lb/lb) product from the stripper(s) [or reactor(s) if the plant has no stripper(s)] for dispersion polyvinyl chloride resins, excluding latex resins, with the product determined on a dry solids basis;

(ii) 0.4 g/kg (0.0004 lb/lb) product from the strippers [or reactor(s) if the plant has no stripper(s)] for all other polyvinyl chloride resins, including latex resins, with the product determined on a dry solids basis.

§ 61.65 Emission standard for ethylene dichloride, vinyl chloride and polyvinyl chloride plants.

An owner or operator of an ethylene dichloride, vinyl chloride, and/or polyvinyl chloride plant shall comply with the requirements of this section.

(a) *Relief valve discharge.* Except for an emergency relief discharge, there is to be no discharge to the atmosphere from any relief valve on any equipment in vinyl chloride service. An emergency relief discharge means a discharge which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any relief valve discharge, the owner or operator of the source from which the relief valve discharge occurs shall submit to the Administrator a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, the approximate total vinyl chloride loss during the discharge, the method used for determining the vinyl chloride loss, the action that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(b) *Fugitive emission sources*—(1) *Loading and unloading lines:* Vinyl chloride emissions from loading and unloading lines in vinyl chloride service which are opened to the atmosphere after each loading or unloading operation are to be minimized as follows:

(i) After each loading or unloading operation and before opening a loading or unloading line to the atmosphere, the quantity of vinyl chloride in all parts of each loading or unloading line that are to be opened to the atmosphere is to be reduced so that the parts combined contain no greater than 0.0038 m^3(0.13 ft^3) of vinyl chloride, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from a loading or unloading line in accordance with paragraph (b)(1)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(2) *Slip gauges.* During loading or unloading operations, the vinyl chloride emissions from each slip gauge in vinyl chloride service are to be minimized by ducting any vinyl chloride discharged from the slip gauge through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(3) Leakage from pump, compressor, and agitator seals:

(i) *Rotating pumps.* Vinyl chloride emissions from seals on all rotating pumps in vinyl chloride service are to be minimized by installing sealless pumps, pumps with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(ii) *Reciprocating pumps.* Vinyl chloride emissions from seals on all reciprocating pumps in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in § 61.66. If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(iii) *Rotating compressor.* Vinyl chloride emissions from seals on all rotating compressors in vinyl chloride service are to be minimized by installing compressors with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(iv) *Reciprocating compressors.* Vinyl chloride emissions from seals on all reciprocating compressors in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in § 61.66. If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(v) *Agitator.* Vinyl chloride emissions from seals on all agitators in vinyl chloride service are to be minimized by installing agitators with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the agitated vessel; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(4) *Leakage from relief valves.* Vinyl chloride emissions due to leakage from each relief valve on equipment in vinyl chloride service are to be minimized by installing a rupture disk between the equipment and the relief valve, by connecting the relief valve discharge to a process line or recovery system, or equivalent as provided in § 61.66.

(5) *Manual venting of gases.* Except as provided in § 61.64(a)(3), all gases which are manually vented from equipment in vinyl chloride service are to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(6) *Opening of equipment.* Vinyl chloride emissions from opening of equipment (including loading or unloading lines that are not opened to the atmosphere after each loading or unloading operation) are to be minimized as follows:

(i) Before opening any equipment for any reason, the quantity of vinyl chloride is to be reduced so that the equipment contains no more than 2.0 percent by volume vinyl chloride or 0.0950 m^3 (25 gal) of vinyl chloride, whichever is larger, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from the equipment in accordance with paragraph (b)(6)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(7) *Samples.* Unused portions of samples containing at least 10 percent by weight vinyl chloride are to be returned to the process, and sampling techniques are to be such that sample containers in vinyl chloride service are purged into a closed process system.

(8) *Leak detection and elimination.* Vinyl chloride emissions due to leaks from equipment in vinyl chloride service are to be minimized by instituting and implementing a formal leak detection and elimination program. The owner or operator shall submit a description of the program to the Administrator for approval. The program is to be submitted within 45 days of the effective date of these regulations, unless a waiver of compliance is granted under § 61.11. If a waiver of compliance is granted, the program is to be submitted on a date scheduled by the Administrator. Approval of a program will be granted by the Administrator provided he finds:

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(i) It includes a reliable and accurate vinyl chloride monitoring system for detection of major leaks and identification of the general area of the plant where a leak is located. A vinyl chloride monitoring system means a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromatography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry, flame ion detection, or an equivalent or alternative method.

(ii) It includes a reliable and accurate portable hydrocarbon detector to be used routinely to find small leaks and to pinpoint the major leaks indicated by the vinyl chloride monitoring system. A portable hydrocarbon detector means a device which measures hydrocarbons with a sensitivity of at least 10 ppm and is of such design and size that it can be used to measure emissions from localized points.

(iii) It provides for an acceptable calibration and maintenance schedule for the vinyl chloride monitoring system and portable hydrocarbon detector. For the vinyl chloride monitoring system, a daily span check is to be conducted with a concentration of vinyl chloride equal to the concentration defined as a leak according to paragraph (b)(8)(vi) of this section. The calibration is to be done with either:

(A) A calibration gas mixture prepared from the gases specified in sections 5.2.1 and 5.2.2 of Test Method 106 and in accordance with section 7.1 of Test Method 106, or

(B) A calibration gas cylinder standard containing the appropriate concentration of vinyl chloride. The gas composition of the calibration gas cylinder standard is to have been certified by the manufacturer. The manufacturer must have recommended a maximum shelf life for each cylinder so that the concentration does not change greater than ±5 percent from the certified value. The date of gas cylinder preparation, certified vinyl chloride concentration and recommended maximum shelf life must have been affixed to the cylinder before shipment from the manufacturer to the buyer. If a gas chromatograph is used as the vinyl chloride monitoring system, these gas mixtures may be directly used to prepare a chromatograph calibration curve as described in section 7.3 of Test Method 106. The requirements in section 5.2.3.1 and 5.2.3.2 of Test Method 106 for certification of cylinder standards and for establishment and verification of calibration standards are to be followed.

(iv) The location and number of points to be monitored and the frequency of monitoring provided for in the program are acceptable when they are compared with the number of pieces of equipment in vinyl chloride service and the size and physical layout of the plant.

(v) It contains an acceptable plan of action to be taken when a leak is detected.

(vi) It contains a definition of leak which is acceptable when compared with the background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system. Measurements of background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system are to be included with the description of the program. The definition of leak for a given plant may vary among the different areas within the plant and is also to change over time as background concentrations in the plant are reduced.

(9) *Inprocess wastewater.* Vinyl chloride emissions to the atmosphere from inprocess wastewater are to be reduced as follows:

(i) The concentration of vinyl chloride in each inprocess wastewater stream containing greater than 10 ppm vinyl chloride measured immediately as it leaves a piece of equipment and before being mixed with any other inprocess wastewater stream is to be reduced to no more than 10 ppm by weight before being mixed with any other inprocess wastewater stream which contains less than 10 ppm vinyl chloride; before being exposed to the atmosphere; before being discharged to a wastewater treatment process; or before being discharged untreated as a wastewater. This paragraph does apply to water which is used to dis-

place vinyl chloride from equipment before it is opened to the atmosphere in accordance with § 61.64(a)(2) or paragraph (b)(6) of this section, but does not apply to water which is used to wash out equipment after the equipment has already been opened to the atmosphere in accordance with § 61.64(a)(2) or paragraph (b)(6) of this section. (ii) Any vinyl chloride removed from the inprocess wastewater in accordance with paragraph (b)(9)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(c) The requirements in paragraphs (b)(1), (b)(2), (b)(5), (b)(6), (b)(7) and (b)(8) of this section are to be incorporated into a standard operating procedure, and made available upon request for inspection by the Administrator. The standard operating procedure is to include provisions for measuring the vinyl chloride in equipment 4.75 m^3 (1,250 gal) in volume for which an emission limit is prescribed in § 61.65(b)(6)(i) prior to opening the equipment and using Test Method 106, a portable hydrocarbon detector, or an equivalent or alternative method. The method of measurement is to meet the requirements in § 61.67(g)(5)(i)(A) or (g)(5)(i)(B).

[41 FR 46564, Oct. 21, 1976; 41 FR 53017, Dec. 3, 1976, as amended at 42 FR 29006, June 7, 1977]

§ 61.66 Equivalent equipment and procedures.

Upon written application from an owner or operator, the Administrator may approve use of equipment or procedures which have been demonstrated to his satisfaction to be equivalent in terms of reducing vinyl chloride emissions to the atmosphere to those prescribed for compliance with a specific paragraph of this subpart. For an existing source, any request for using an equivalent method as the initial measure of control is to be submitted to the Administrator within 30 days of the effective date. For a new source, any request for using an equivalent method is to be submitted to the Administrator with the application for approval of construction or modification required by § 61.07.

§ 61.67 Emission tests.

(a) Unless a waiver of emission testing is obtained under § 61.13, the owner or operator of a source to which this subpart applies shall test emissions from the source,

(1) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date, or

(2) Within 90 days of startup in the case of a new source, initial startup of which occurs after the effective date.

(b) The owner or operator shall provide the Administrator at least 30 days prior notice of an emission test to afford the Administrator the opportunity to have an observer present during the test.

(c) Any emission test is to be conducted while the equipment being tested is operating at the maximum production rate at which the equipment will be operated and under other relevant conditions as may be specified by the Administrator based on representative performance of the source.

(d) [Reserved]

(e) When at all possible, each sample is to be analyzed within 24 hours, but in no case in excess of 72 hours of sample collection. Vinyl chloride emissions are to be determined within 30 days after the emission test. The owner or operator shall report the determinations to the Administrator by a registered letter dispatched before the close of the next business day following the determination.

(f) The owner or operator shall retain at the plant and make available, upon request, for inspection by the Administrator, for a minimum of 2 years records of emission test results and other data needed to determine emissions.

(g) Unless otherwise specified, the owner or operator shall use test Test Methods in Appendix B to this part for each test as required by paragraphs (g)(1), (g)(2), (g)(3), (g)(4), and (g)(5) of this section, unless an equivalent method or an alternative method has been approved by the Administra-

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tor. If the Administrator finds reasonable grounds to dispute the results obtained by an equivalent or alternative method, he may require the use of a reference method. If the results of the reference and equivalent or alternative methods do not agree, the results obtained by the reference method prevail, and the Administrator may notify the owner or operator that approval of the method previously considered to be equivalent or alternative is withdrawn.

(1) Test Method 106 is to be used to determine the vinyl chloride emissions from any source for which an emission limit is prescribed in §§ 61.62(a) or (b) § 61.63(a), or §§ 61.64(a)(1), (b), (c), or (d), or from any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted is § 61.65(b)(1)(ii), (b)(2), (b)(5), (b)(6)(ii), or (b)(9)(ii).

(i) For each run, one sample is to be collected. The sampling site is to be at least two stack or duct diameters downstream and one half diameter upstream from any flow disturbance such as a bend, expansion, contraction, or visible flame. For a rectangular cross section an equivalent diameter is to be determined from the following equation:

$$\text{equivalent diameter} = 2\ (\text{length})\ (\text{width}) / \text{length} + \text{width}$$

The sampling point in the duct is to be at the centroid of the cross section. The sample is to be extracted at a rate proportional to the gas velocity at the sampling point. The sample is to be taken over a minimum of one hour, and is to contain a minimum volume of 50 liters corrected to standard conditions.

(ii) Each emission test is to consist of three runs. For the purpose of determining emissions, the average of results of all runs is to apply. The average is to be computed on a time weighted basis.

(iii) For gas streams containing more than 10 percent oxygen the concentration of vinyl chloride as determined by Test Method 106 is to be corrected to 10 percent oxygen (dry basis) for determination of emissions by using the following equation:

$$C_{b\ (corrected)} = C_b\ 10.9 / 20.9 - \text{percent } O_2$$

where:

$C_{b\ (corrected)}$ = The concentration of vinyl chloride in the exhaust gases, corrected to 10-percent oxygen.
C_b = The concentration of vinyl chloride as measured by Test Method 106.
20.9 = Percent oxygen in the ambient air at standard conditions.
10.9 = Percent oxygen in the ambient air at standard conditions, minus the 10.0-percent oxygen to which the correction is being made.
Percent O_2 = Percent oxygen in the exhaust gas as measured by Reference Method 3 in Appendix A of Part 60 of this chapter.

(iv) For those emission sources where the emission limit is prescribed in terms of mass rather than concentration, mass emissions in kg/100 kg product are to be determined by using the following equation:

$$C_{bx} = [\quad (2.60)\ Q\ 10^{-6}]\ [100] / Z$$

where:

C_{bx} = kg vinyl chloride/100 kg product.
C_b = The concentration of vinyl chloride as measured by Test Method 106.
2.60 = Density of vinyl chloride at one atmosphere and 20° C in kg/m³.
Q = Volumetric flow rate in m³/hr as determined by Reference Method 2 of Appendix A to Part 60 of this chapter.
10^{-6} = Conversion factor for ppm.
Z = Production rate (kg/hr).

(2) Test Method 107 is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream for which an emission limit is prescribed in § 61.65(b)(9)(i).

(3) Where a stripping operation is used to attain the emission limit in § 61.64(e), emissions are to be determined using Test Method 107 as follows:

(i) The number of strippers and samples and the types and grades of resin to be sampled are to be determined by the Administrator for each individual plant at the time of the test based on the plant's operation.

(ii) Each sample is to be taken immediately following the stripping operation.

(iii) The corresponding quantity of material processed by each stripper is to be determined on a dry solids basis and by a method submitted to and approved by the Administrator.

(iv) At the prior request of the Administrator, the owner or operator shall provide duplicates of the samples required in paragraph (g)(3)(i) of this section.

(4) Where control technology other than or in addition to a stripping operation is used to attain the emission limit in § 61.64(e), emissions are to be determined as follows:

(i) Test Method 106 is to be used to determine atmospheric emissions from all of the process equipment simultaneously. The requirements of paragraph (g)(1) of this section are to be met.

(ii) Test Method 107 is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream subject to the emission limit prescribed in § 61.64(e). The mass of vinyl chloride in kg/100 kg product in each inprocess wastewater stream is to be determined by using the following equation:

$$C_{BX} = [C_d R 10^{-6}] [100]/Z$$

where:

C_{BX} = kg vinyl chloride/100 kg product.
C_d = the concentration of vinyl chloride as measured by Test Method 107.
R = water flow rate in 1/hr, determined in accordance with a method which has been submitted to and approved by the Administrator.
10^{-6} = Conversion factor for ppm.
Z = Production rate (kg/hr), determined in accordance with a method which has been submitted and approved by the Administrator.

(5) The reactor opening loss for which an emission limit is prescribed in § 61.64 (a)(2) is to be determined. The number of reactors for which the determination is to be made is to be specified by the Administrator for each individual plant at the time of the determination based on the plant's operation. For a reactor that is also used as a stripper, the determination may be made immediately following the stripping operation.

(i) Except as provided in paragraph (g)(5)(ii) of this section, the reactor opening loss is to be determined using the following equation:

$$C = W(2.60)(10^{-6})(Cb)/YZ$$

where:

C = kg vinyl chloride emissions/kg product.
W = Capacity of the reactor in m^3.
2.60 = Density of vinyl chloride at one atmosphere and 20° C in kg/m^3.
10^{-6} = Conversion factor for ppm.
C_b = ppm by volume vinyl chloride as determined by Test Method 106 or a portable hydrocarbon detector which measures hydrocarbons with a sensitivity of at least 10 ppm.
Y = Number of batches since the reactor was last opened to the atmosphere.
Z = Average kg of polyvinyl chloride produced per batch in the number of batches since the reactor was last opened to the atmosphere.

(A) If Method 106 is used to determine the concentration of vinyl chloride (Cb), the sample is to be withdrawn at a constant rate with a probe of sufficient length to reach the vessel bottom from the manhole. Samples are to be taken for 5 minutes within 6 inches of the vessel bottom, 5 minutes near the vessel center, and 5 minutes near the vessel top.

(B) If a portable hydrocarbon detector is used to determine the concentration of vinyl chloride (Cb), a probe of sufficient length to reach the vessel bottom from the manhole is to be used to make the measurements. One measurement will be made within 6 inches of the vessel bottom, one near the vessel center and one near the vessel top. Measurements are to be made at each location until the reading is stabilized. All hydrocarbons measured are to be assumed to be vinyl chloride.

(C) The production rate of polyvinyl chloride (Z) is to be determined by a method submitted to and approved by the Administrator.

(ii) A calculation based on the number of evacuations, the vacuum involved, and the volume of gas in the reactor is hereby approved by the Administrator as an alternative method for determining reactor opening loss for postpolymerization reactors in the manufacture of bulk resins.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 46564, Oct. 21, 1976, as amended at 42 FR 29007, June 7, 1977; 43 FR 8800, Mar. 3, 1978]

§ 61.68 Emission monitoring.

(a) A vinyl chloride monitoring system is to be used to monitor on a

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continuous basis the emissions from the sources for which emission limits are prescribed in § 61.62(a) and (b), § 61.63(a), and § 61.64 (a)(1), (b), (c), and (d), and for any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted in § 61.65 (b)(1)(ii), and (b)(2), (b)(5), (b)(6) (ii), and (b)(9)(ii).

(b) The vinyl chloride monitoring system(s) used to meet the requirement in paragraph (a) of this section is to be a device which obtains air sampels from one or more points on a continuous sequential basis and analyzes the samples with gas chromotography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry, flame ion detection, or an equivalent or alternative method. The vinyl chloride monitoring system used to meet the requirements in § 61.65(b)(8)(i) may be used to meet the requirements of this section.

(c) A daily span check is to be conducted for each vinyl chloride monitoring system used. For all of the emission sources listed in paragraph (a) of this section, except the one for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride equal to 10 ppm. For the emission source for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride which is determined to be equivalent to the emission limit for that source based on the emission test required by § 61.67. The calibration is to be done with either:

(1) A calibration gas mixture prepared from the gases specified in sections 5.2.1 and 5.2.2 of Test Method 106 and in accordance with section 7.1 of Test Method 106, or

(2) A calibration gas cylinder standard containing the appropriate concentration of vinyl chloride. The gas composition of the calibration gas cylinder standard is to have been certified by the manufacturer. The manufacturer must have recommended a maximum shelf life for each cylinder so that the concentration does not change greater than ±5 percent from the certified value. The date of gas cylinder preparation, certified vinyl chloride concentration and recommended maximum shelf life must have been affixed to the cylinder before shipment from the manufacturer to the buyer. If a gas chromatograph is used as the vinyl chloride monitoring system, these gas mixtures may be directly used to prepare a chromatograph calibration curve as described in section 7.3 of Test Method 106. The requirements in sections 5.2.3.1 and 5.2.3.2 of Test Method 106 for certification of cylinder standards and for establishment and verification of calibration standards are to be followed.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 46564, Oct. 21, 1976; 41 FR 53017, Dec. 3, 1976, as amended at 42 FR 29007, June 7, 1977; 43 FR 8800, Mar. 3, 1978]

§ 61.69 Initial report.

(a) An owner or operator of any source to which this subpart applies shall submit a statement in writing notifying the Administrator that the equipment and procedural specifications in § 61.65 (b)(1), (b)(2), (b)(3), (b)(4), (b)(5), (b)(6), (b)(7), and (b)(8) are being implemented.

(b)(1) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the effective date, unless a waiver of compliance is granted under § 61.11, along with the information required under § 61.10. If a waiver of compliance is granted, the statement is to be submitted on a date scheduled by the Administrator.

(2) In the case of a new source which did not have an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the initial startup date.

(c) The statement is to contain the following information:

(1) A list of the equipment installed for compliance,

(2) A description of the physical and functional characteristics of each piece of equipment,

(3) A description of the methods which have been incorporated into the

standard operating procedures for measuring or calculating the emissions for which emission limits are prescribed in § 61.65 (b)(1)(i) and (b)(6)(i).

(4) A statement that each piece of equipment is installed and that each piece of equipment and each procedure is being used.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 46564, Oct. 21, 1976, as amended at 43 FR 8800, Mar. 3, 1978]

§ 61.70 Semiannual report.

(a) The owner or operator of any source to which this subpart applies shall submit to the Administrator on September 15 and March 15 of each year a report in writing containing the information required by this section. The first semiannual report is to be submitted following the first full 6 month reporting period after the initial report is submitted.

(b)(1) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the first report is to be submitted within 180 days of the effective date, unless a waiver of compliance is granted under § 61.11. If a waiver of compliance is granted, the first report is to be submitted on a date scheduled by the Administrator.

(2) In the case of a new source which did not have an initial startup date preceding the effective date, the first report is to be submitted within 180 days of the initial startup date.

(c) Unless otherwise specified, the owner or operator shall use the Test Methods in Appendix B to this part to conduct emission tests as required by paragraphs (c)(2) and (c)(3) of this section, unless an equivalent or an alternative method has been approved by the Administrator. If the Administrator finds reasonable grounds to dispute the results obtained by an equivalent or alternative method, he may require the use of a reference method. If the results of the reference and equivalent or alternative methods do not agree, the results obtained by the reference method prevail, and the Administrator may notify the owner or operator that approval of the method previously considered to be equivalent or alternative is withdrawn.

(1) The owner or operator shall include in the report a record of any emissions which averaged over any hour period (commencing on the hour) are in excess of the emission limits prescribed in §§ 61.62(a) or (b), § 61.63 (a), or § 61.64 (a)(1), (b), (c), or (d), or for any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted in § 61.65 (b)(1)(ii), (b)(2), (b)(5), (b)(6)(ii), or (b)(9)(ii). The emissions are to be measured in accordance with § 61.68.

(2) In polyvinyl chloride plants for which a stripping operation is used to attain the emission level prescribed in § 61.64(e), the owner or operator shall include in the report a record of the vinyl chloride content in the polyvinyl chloride resin. Test Method 107 is to be used to determine vinyl chloride content as follows:

(i) If batch stripping is used, one representative sample of polyvinyl chloride resin is to be taken from each batch of each grade of resin immediately following the completion of the stripping operation, and identified by resin type and grade and the date and time the batch is completed. The corresponding quantity of material processed in each stripper batch is to be recorded and identified by resin type and grade and the date and time the batch is completed.

(ii) If continuous stripping is used, one representative sample of polyvinyl chloride resin is to be taken for each grade of resin processed or at intervals of 8 hours for each grade of resin which is being processed, whichever is more frequent. The sample is to be taken as the resin flows out of the stripper and identified by resin type and grade and the date and time the sample was taken. The corresponding quantity of material processed by each stripper over the time period represented by the sample during the 8-hour period, is to be recorded and identified by resin type and grade and the date and time it represents.

(iii) The quantity of material processed by the stripper is to be determined on a dry solids basis and by a method submitted to and approved by the Administrator.

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(iv) At the prior request of the Administrator, the owner or operator shall provide duplicates of the samples required in paragraphs (c)(2)(i) and (c)(2)(ii) of this section.

(v) The report to the Administrator by the owner or operator is to include the vinyl chloride content found in each sample required by paragraphs (c)(2) (i) and (c)(2)(ii) of this section, averaged separately for each type of resin, over each calendar day and weighted according to the quantity of each grade of resin processed by the stripper(s) that calendar day, according to the following equation:

$$A_{T_i} = \frac{\sum_{i}^{n} = 1 P_{G_i} M_{G_i}}{Q_{T_i}} = \frac{P_{G_1} M_{G_1} + P_{G_2} M_{G_2} + \cdots + P_{G_n} M_{G_n}}{Q_{T_i}}$$

where:

A = 24-hour average concentration of type, T_i resin in ppm (dry weight basis).
Q = Total production of type T_i resin over the 24-hour period, in kg.
T_i = Type of resin; $i = 1,2 \ldots m$ where m is total number of resin types produced during the 24-hour period.
M = Concentration of vinyl chloride in one sample of grade G_i resin, in ppm.
P = Production of grade G_i resin represented by the sample, in kg.
G_i = Grade of resin; e.g., G_1, G_2, and G_3.
n = Total number of grades of resin produced during the 24-hour period.

(vi) The owner or operator shall retain at the source and make available for inspection by the Administrator for a minimum of 2 years records of all data needed to furnish the information required by paragraph (c)(2)(v) of this section: The records are to contain the following information:

(A) The vinyl chloride content found in all the samples required in paragraphs (c)(2)(i) and (c)(2)(ii) of this section, identified by the resin type and grade and the time and date of the sample, and

(B) The corresponding quantity of polyvinyl chloride resin processed by the stripper(s), identified by the resin type and grade and the time and date it represents.

(3) The owner or operator shall include in the report a record of the emissions from each reactor opening for which an emission limit is prescribed in § 61.64(a)(2). Emissions are to be determined in accordance with § 61.67(g)(5), except that emissions for each reactor are to be determined. For a reactor that is also used as a stripper, the determination may be made immediately following the stripping operation.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 46564, Oct. 21, 1976; 41 FR 53018, Dec. 3, 1976, as amended at 42 FR 29007, June 7, 1977; 43 FR 8800, Mar. 3, 1978]

§ 61.71 Recordkeeping.

(a) The owner or operator of any source to which this subpart applies shall retain the following information at the source and make it available for inspection by the Administrator for a minimum of two years;

(1) A record of the leaks detected by the vinyl chloride monitoring system, as required by § 61.65(b)(8), including the concentrations of vinyl chloride measured, analyzed, and recorded by the vinyl chloride detector, the location of each measurement and the date and approximate time of each measurement.

(2) A record of the leaks detected during routine monitoring with the portable hydrocarbon detector and the action taken to repair the leaks, as required by § 61.65(b)(8), including a brief statement explaining the location and cause of each leak detected with the portable hydrocarbon detector, the date and time of the leak, and any action taken to eliminate that leak.

(3) A record of emissions measured in accordance with § 61.68.

(4) A daily operating record for each polyvinyl chloride reactor, including pressures and temperatures.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[41 FR 46594, Oct. 21, 1976, as amended at 42 FR 29007, June 7, 1977; 43 FR 8800, Mar. 3, 1978]

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APPENDIX A

National Emission Standards for Hazardous Air Pollutants

Compliance Status Information

I. SOURCE REPORT

INSTRUCTIONS: Owners or operators of sources of hazardous pollutants subject to the National Emission Standards for Hazardous Air Pollutants are required to submit the information contained in Section I to the appropriate U.S. Environmental Protection Agency Regional Office prior to 90 days after the effective date of any standards or amendments which require the submission of such information.

A list of regional offices is provided in §61.04.

A. SOURCE INFORMATION

1. Identification/Location - Indicate the name and address of each source.

1 2 Region | 3 4 State | 5 8 County | 9 13 Source Number | 14 0 0 0 16 | 17 0 0 18 | 19 1

20 22 AQCR # | 23 26 City Code | 27 Source Name 46

47 Street Address (Location of Plant) 66 | 80

Dup 1-18 | 19

20 City Name 34 | State 35 39

40 State Regis. Number 54 | 55 58 NEDS X Ref.

59 SIC 62 | FF 64 | A/P 65 | 77 79 Staff | 80

Dup 1-18 | 19 5

CS 30 | SIP 31 | EC 49 | 80

2. Contact - Indicate the name and telephone number of the owner or operator or other responsible official whom EPA may contact concerning this report.

Dup 1-18 4 1
19 20 21 Name 43

44 46 47 Number 54 80
Area Code

3. Source Description - Briefly state the nature of the source (e.g., "Chlor-alkali Plant" or "Machine Shop").

Dup 1-18 4 2
19 20 21 Description 50

51 Continued 79 80

4. Alternative Mailing Address - Indicate an alternative mailing address if correspondence is to be directed to a location different than that specified above.

Dup 1-18 4 3
19 20 21 Number Street or Box Number 45 80

Dup 1-18 4 4
19 20 21 City 35 37 38 State 41 Zip 44 80

5. Compliance Status - The emissions from this source ___ can ___ cannot meet the emission limitations contained in the National Emission Standards on or prior to 90 days after the effective date of any standards or amendments which require the submission of such information.

Signature of Owner, Operator or Other Responsible Official

NOTE: If the emissions from the source will exceed those limits set by the National Emission Standards for Hazardous Air Pollutants, the source will be in violation and subject to Federal enforcement actions unless granted a waiver of compliance by the Administrator of the U.S. Environmental Protection Agency. The information needed for such waivers is listed in Section II of this form.

B. PROCESS INFORMATION. Part B should be completed separately for each point of emission for each hazardous pollutant. [Sources subject to 61.22(1) may omit number 4. below.]

Dup 1-13 0 0 5
14 16 17 18 19 20 SCC 27 28 29 30 31
NEDS X Ref LS SIP

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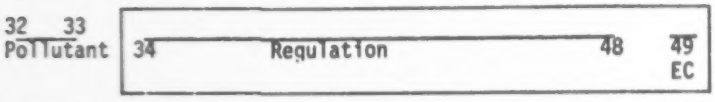
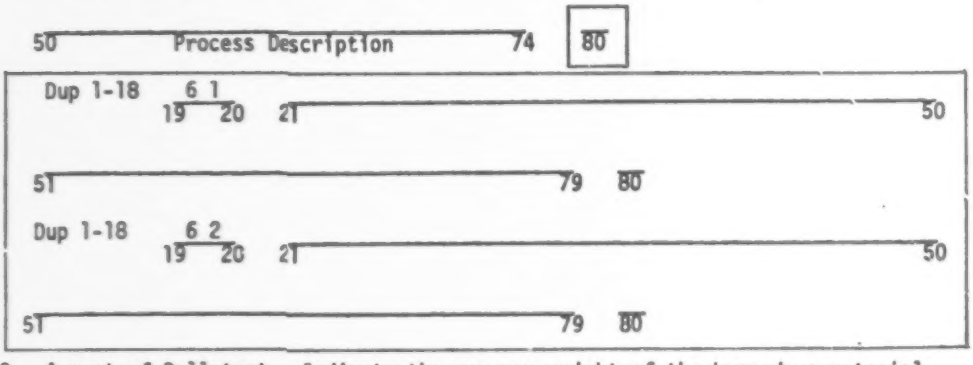
1. Pollutant Emitted - Indicate the type of hazardous pollutant emitted by the process. Indicate "AS" for asbestos, "BE" for beryllium, or "HG" for mercury.

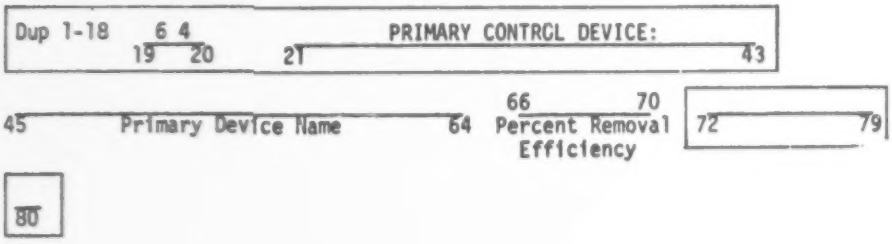


2. Process Description - Provide a brief description of each process (e.g., "hydrogen end box" in a mercury chlor-alkali plant, "grinding machine" in a beryllium machine shop). Use additional sheets if necessary.



3. Amount of Pollutant - Indicate the average weight of the hazardous material named in Item 1 which enters the process in pounds per month (based on the previous twelve months of operation).

4. Control Devices
   a. Indicate the type of pollution control devices, if any, used to reduce the emissions from the process (e.g., venturi scrubber, baghouse, wet cyclone) and the estimated percent of the pollutant which the device removes from the process gas stream.



Dup 1-18	6 5	SECONDARY CONTROL DEVICES:
	19 20	21 45

47 Secondary Device Name 64	66 70 Percent Removal Efficiency	% EFFIC. 72 79 80

b. Asbestos Emission Control Devices Only

i. If a baghouse is specified in Item 4a, give the following information:

- The air flow permeability in cubic feet per minute per square foot of fabric area.

  Air flow permeability = _____ cfm/ft^2

- The pressure drop in inches water gauge across the filter at which the baghouse is operated.

  Operating pressure drop = _____ inches w.g.

- If the baghouse material contains synthetic fill yarn, check whether this material is / / spun / / or not spun.

- If the baghouse utilizes a felted fabric, give the minimum thickness in inches and the density in ounces per square yard.

  Thickness = _____ inches Density = _____ oz/yd^2

ii. If a wet collection device is specified in Item 4a, give the designed unit contacting energy in inches water gauge.

- Unit contacting energy = _____ inches w.g.

C. DISPOSAL OF ASBESTOS-CONTAINING WASTES. Part C should be completed separately for each asbestos-containing waste generation operation arising from sources subject to §61.22(a), (c), (e), and (h).

Dup 1-13		0 0	5				
14 16	17 18	19	20 SCC 27	28 29 NEDS X Ref	30 CS	31 SIP

A B			
32 33 Pollutant	34 Regulation 48	49 EC	

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1. Waste Generation - Provide a brief description of each process that generates asbestos-containing waste (e.g. disposal of control device wastes).

50 Process Description 79 80

2. Asbestos Concentration - Indicate the average percentage asbestos content of these materials.

Dup 1-18 6 1 (19 20) 21 ASBESTOS CONCENTRATION: 43 45 48

% 50 80

3. Amount of Wastes - Indicate the average weight of asbestos-containing wastes disposed of, measured in kg/day.

Dup 1-18 6 2 (19 20) 21 27 29 kg/day 34 80

4. Control Methods - Indicate the emission control methods used in all stages of waste disposal, from collection, processing, and packaging to transporting and deposition.

Dup 1-18 6 3 (19 20) 21 Primary Control Method 43

45 79 80

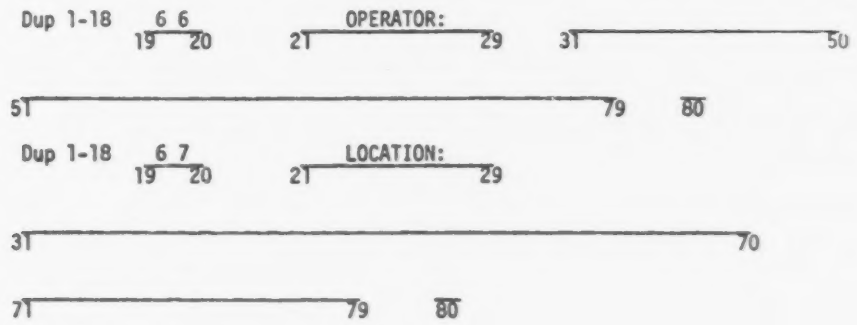
Dup 1-18 6 4 (19 20) 21 50

51 79 80

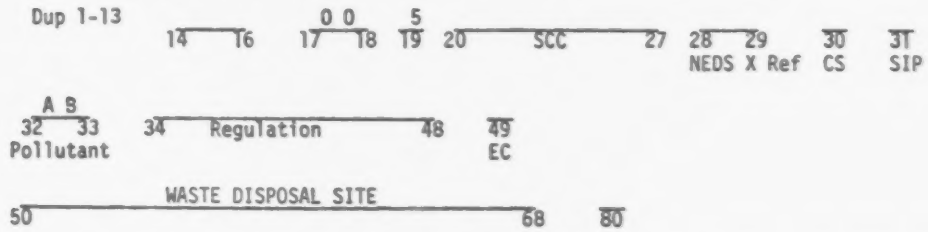
5. Waste Disposal - Indicate the type of disposal site (sanitary landfill, open, covered) or incineration site (municipal, private) where the waste is disposed of and who operates the site (company, private, municipal). State the name and location of the site (closest city or town, county, state).

Dup 1-18 6 5 (19 20) 21 TYPE OF SITE: 33 35 50

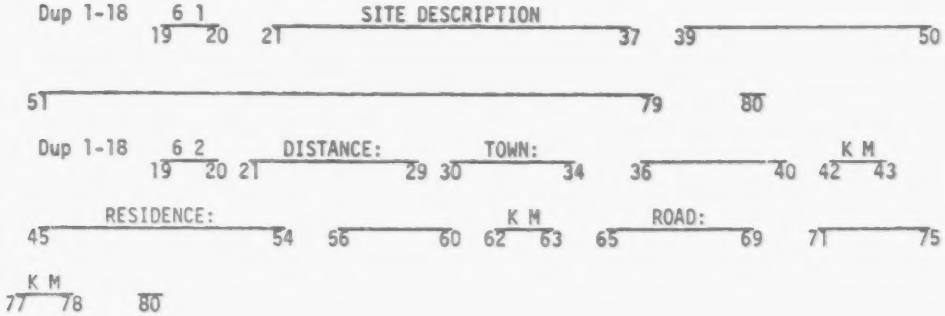
51 79 80



D. WASTE DISPOSAL SITES. Part D should be completed separately for each asbestos waste disposal site subject to section 61.22(1).



1. Description - Provide a brief description of the site, including its size and configuration, and the distance to the closest city or town, closest residence, and closest primary road.



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2. Inactivation - After the site is inactivated, indicate the method or methods used to comply with the standard and send a list of the actions that will be undertaken to maintain the inactivated site.

Dup 1-18 6 8 COMPLIANCE METHOD/INACTIVE SITE:
19 20 21 52

54 79 80

II. WAIVER REQUESTS

A. WAIVER OF COMPLIANCE. Owners or operators of sources unable to operate in compliance with the National Emission Standards for Hazardous Air Pollutants prior to 90 days after the effective date of any standards or amendments which require the submission of such information may request a waiver of compliance from the Administrator of the U.S. Environmental Protection Agency for the time period necessary to install appropriate control devices or make modifications to achieve compliance. The Administrator may grant a waiver of compliance with the standard for a period not exceeding two years from the effective date of the hazardous pollutant standards, if he finds that such period is necessary for the installation of controls and that steps will be taken during the period of the waiver to assure that the health of persons will be protected from imminent endangerment.

The report information provided in Section I must accompany this application. Applications should be sent to the appropriate EPA regional office.

1. Processes Involved - Indicate the process or processes emitting hazardous pollutants to which emission controls are to be applied.

2. Controls

   a. Describe the proposed type of control device to be added or modification to be made to the process to reduce the emissions of hazardous pollutants to an acceptable level. (Use additional sheets if necessary.)

   b. Describe the measures that will be taken during the waiver period to assure that the health of persons will be protected from imminent endangerment. (Use additional sheets if necessary.)

3. Increments of Progress - Specify the dates by which the following increments of progress will be met.

   · Date by which contracts for emission control systems or process modifications will be awarded; or date by which orders will be issued for the purchase of the component parts to accomplish emission control or process modification.

Dup 1-16 017
17 19 53 54 55 60 61 MO/DY/YR 66 80

· Date of initiation of on-site construction or installation of emission control equipment or process change.

Dup 1-16 027
17 19 53 54 55 60 61 MO/DY/YR 66 80

· Date by which on-site construction or installation of emission control equipment or process modification is to be completed.

Dup 1-16 037
17 19 53 54 55 60 61 MO/DY/YR 66 80

· Date by which final compliance is to be achieved.

Dup 1-16 047
17 19 53 54 55 60 61 MO/DY/YR 66 80

B. WAIVER OF EMISSION TESTS. A waiver of emission testing may be granted to owners or operators of sources of beryllium or mercury pollutants if, in the judgment of the Administrator of the Environmental Protection Agency the emissions from the source comply with the appropriate standard or if the owners or operators of the source have requested a waiver of compliance or have been granted a waiver of compliance.

This application should accompany the report information provided in Section I.

1. Reason - State the reasons for requesting a waiver of emission testing. If the reason stated is that the emissions from the source are within the prescribed limits, documentation of this condition must be attached.

_____

_____

_____ _____
Date Signature of the owner or operator

(Sec. 114, of the Clean Air Act as amended (42 U.S.C. 7414))

[40 FR 48303, Oct. 14, 1975, as amended at 43 FR 8800, Mar. 3, 1978]

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Appendix B—Test Methods

Method 101—Determination of Particulate and Gaseous Mercury Emissions From Chlor-Alkali Plants—Air Streams

1. *Applicability and Principle*—1.1 *Applicability.* This method applies to the determination of particulate and gaseous mercury (Hg) emissions from chlor-alkali plants and other sources (as specified in the regulations), where the carrier-gas stream in the duct or stack is principally air.

1.2 *Principle.* Particulate and gaseous Hg emissions are withdrawn isokinetically from the source and collected in acidic iodine monochloride (ICl) solution. The Hg collected (in the mercuric form) is reduced to elemental Hg, which is then aerated from the solution into an optical cell and measured by atomic absorption spectrophotometry.

2. *Range and Sensitivity*—2.1 *Range.* After initial dilution, the range of this method is 0.5 to 120 μg Hg/ml. The upper limit can be extended by further dilution of the sample.

2.2 *Sensitivity.* The sensitivity of this method depends on the recorder/spectrophotometer combination selected.

3. *Interfering Agents*—3.1 *Sampling.* SO_2 reduces ICl and causes premature depletion of the ICl solution.

3.2 *Analysis.* ICl concentrations greater than 10^{-4} molar inhibit the reduction of the Hg (II) ion in the aeration cell. Condensation of water vapor on the optical cell windows causes a positive interference.

4. *Precision and Accuracy*—The following estimates are based on collaborative tests, wherein 13 laboratories performed duplicate analyses on two Hg-containing samples from a chlor-alkali plant and on one laboratory-prepared sample of known Hg concentration. The concentration ranged from 2 to 65 μg Hg/ml.

4.1 *Precision.* The estimated within-laboratory and between-laboratory standard deviations are 1.6 and 1.8 μg Hg/ml, respectively.

4.2 *Accuracy.* The participating laboratories that analyzed a 64.3-μg Hg/ml (in 0.1 M ICl) standard obtained a mean of 63.7 μg Hg/ml.

5. *Apparatus*—5.1 *Sampling Train.* A schematic of the sampling train is shown in Figure 101-1; it is similar to the Method 5 train (mention of Method 5 refers to Parts 60 of 40 CFR). The sampling train consists of the following components:

5.1.1 *Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Metering System, Barometer, and Gas Density Determination Equipment.* Same as Method 5, Sections 2.1.1, 2.1.3, 2.1.4, 2.1.8, 2.1.9, and 2.1.10, respectively.

5.1.2 *Probe Liner.* Borosilicate or quartz glass tubing. The tester may use a heating system capable of maintaining a gas temperature of 120±14° C (248±25° F) at the probe exit during sampling to prevent water condensation.

NOTE: Do not use metal probe liners.

5.1.3 *Impingers.* Four Greenburg-Smith impingers connected in series with leak-free ground glass fittings or any similar leak-free noncontaminating fittings. For the first, third, and fourth impingers, the tester may use impingers that are modified by replacing the tip with a 13-mm-ID (0.5-in.) glass tube extending to 13 mm (0.5 in.) from the bottom of the flask.

5.1.4 *Acid Trap.* Mine Safety Appliances air line filter, Catalog number 81857, with acid absorbing cartridge and suitable connections, or equivalent.

5.2 *Sample Recovery.* The following items are needed:

5.2.1 *Glass Sample Bottles.* Leakless, with Teflon-lined caps, 1000- and 100-ml.

5.2.2 *Graduated Cylinder.* 250-ml.

5.2.3 *Funnel and Rubber Policeman.* To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

5.2.4 *Funnel.* Glass, to aid in sample recovery.

5.3 *Sample Preparation and Analysis.* The following equipment is needed:

5.3.1 *Atomic Absorption Spectrophotometer.* Perkin-Elmer 303, or equivalent, containing a hollow-cathode mercury lamp and the optical cell described in Section 5.3.2.

5.3.2 *Optical Cell.* Cylindrical shape with quartz end windows and having the dimensions shown in Figure 101-2. Wind the cell with approximately 2 meters of 24-gauge nichrome heating wire, and wrap with fiberglass insulation tape or equivalent; do not let the wires touch each other.

5.3.3 *Aeration Cell.* Constructed according to the specifications in Figure 101-3. Do not use a glass frit as a substitute for the blown glass bubbler tip shown in Figure 101-3.

5.3.4 *Recorder.* Matched to output of the spectrophotometer described in Section 5.3.1.

5.3.5 *Variable Transformer.* To vary the voltage on the optical cell from 0 to 40 volts.

5.3.6 *Hood.* For venting optical cell exhaust.

5.3.7 *Flowmetering Valve.*

5.3.8 *Flowmeter.* Rotameter or equivalent, capable of measuring a gas flow of 1.5 liters/min.

5.3.9 *Aeration Gas Cylinder.* Nitrogen or dry, Hg-free air, equipped with a single-stage regulator.

5.3.10 *Connecting Tubing.* Use glass tubing (ungreased ball- and socket connections are recommended) for all tubing connections between the solution cell and the optical cell; do not use Tygon tubing, other types of flexible tubing, or metal tubing as substitutes. The tester may use Teflon, steel, or copper tubing between the nitrogen tank and flowmetering valve (5.3.7), and Tygon, gum, or rubber tubing between the flowmetering valve and the aeration cell.

5.3.11 *Flow Rate Calibration Equipment.* Bubble flowmeter or wet test meter for measuring a gas flow rate of 1.5±0.1 liters/min.

5.3.12 *Volumetric Flasks.* Class A with penny head standard taper stoppers; 100-, 250-, 500- and 1000-ml.

5.3.13 *Volumetric Pipets.* Class A; 1-, 2-, 3-, 4-, and 5-ml.

5.3.14 *Graduated Cylinder.* 50-ml.

5.3.15 *Magentic Stirrer.* General-purpose laboratory type.

5.3.16 *Magnetic Stirring Bar.* Teflon-coated.

5.3.17 *Balance.* Capable of weighing to ±0.5 g.

5.4 *Alternative Analytical Apparatus.* Alternative systems are allowable as long as they meet the following criteria:

5.4.1 A linear calibration curve is generated and two consecutive samples of the same aliquot size and concentration agree within 3 percent of their average.

5.4.2 A minimum of 95 percent of the spike is recovered when an aliquot of a source sample is spiked with a known concentration of mercury (II) compound.

5.4.3 The reducing agent should be added after the aeration cell is closed.

5.4.4 The aeration bottle bubbler should not contain a frit.

5.4.5 Any Tygon used should be as short as possible and conditioned prior to use until blanks and standards yield linear and reproducible results.

5.4.6 If manual stirring is done before aeration, it should be done with the aeration cell closed.

5.4.7 A drying tube should not be used unless it is conditioned as the Tygon above.

6. *Reagents*—Use ACS reagent-grade chemicals or equivalent, unless otherwise specified.

6.1 *Sampling and Recovery.* The reagents used in sampling and recovery are as follows:

6.1.1 *Water.* Deionized distilled, meeting ASTM Specifications for Type I Reagent Water—ASTM Test Method D 1193-74. If high concentrations of organic matter are not expected to be present, the analyst may eliminate the $KMnO_4$ test for oxidizable organic matter. Use this water in all dilutions and solution preparations.

6.1.2 *Nitric Acid (HNO_3),* 50 Percent (V/V). Mix equal volumes of concentrated HNO_3 and deionized distilled water, being careful to slowly add the acid to the water.

6.1.3 *Silica Gel.* Indicating type, 6- to 16-mesh. If previously used, dry at 175° C (350° F) for 2 hours. The tester may use new silica gel as received.

6.1.4 *Potassium Iodide (KI) Solution, 25 Percent.* Dissolve 250 g of KI in deionized distilled water and dilute to 1 liter.

6.1.5 *Iodine Monochloride (ICl) Stock Solution, 1.0 M.* To 800 ml of 25 percent KI solution, add 800 ml of concentrated hydrochloric acid (HCl). Cool to room temperature. With vigorous stirring, slowly add 135 g of potassium iodate (KIO_3) and stir until all free iodine has dissolved. A clear orange-red solution occurs when all the KIO_3 has been added. Cool to room temperature and dilute to 1800 ml with deionized distilled water. Keep the solution in amber glass bottles to prevent degradation.

6.1.6 *Absorbing Solution, 0.1 M ICl.* Dilute 100 ml of the 1.0 M ICl stock solution to 1 liter with deionized distilled water. Keep the solution in amber glass bottles and in darkness to prevent degradation. This reagent is stable for at least 2 months.

6.2 *Sample Preparation and Analysis.* The reagents needed are listed below:

6.2.1 *Tin (II) Solution.* Prepare fresh daily and keep sealed when not being used. Completely dissolve 20 g of tin (II) chloride [or 25 g of tin (II) sulfate] crystals (Baker Analyzed reagent grade or any other brand that will give a clear solution) in 25 ml of concentrated HCl. Dilute to 250 ml with deionized distilled water. Do not substitute HNO_3, H_2SO_4, or other strong acids for the HCl.

6.2.2 *Mercury Stock Solution, 1 mg Hg/ml.* Prepare and store all mercury standard solutions in borosilicate glass containers. Completely dissolve 0.1354 g of mercury (II) chloride in 75 ml of deionized distilled water in a 100 ml glass volumetric flask. Add 10 ml of concentrated HNO_3, and adjust the volume to exactly 100 ml with deionized distilled water. Mix thoroughly. This solution is stable for at least 1 month.

6.2.3 *Sulfuric Acid, 5 Percent (V/V).* Dilute 25 ml of concentrated H_2SO_4 to 500 ml with deionized distilled water.

6.2.4 *Intermediate Mercury Standard Solution, 10 μg Hg/ml.* Prepare fresh weekly. Pipet 5.0 ml of the mercury stock solution (6.2.2) into a 500-ml glass volumetric flask and add 20 ml of the 5 percent H_2SO_4 solution. Dilute to exactly 500 ml with deionized distilled water. Thoroughly mix the solution.

6.2.5 *Working Mercury Standard Solution, 200 ng Hg/ml.* Prepare fresh daily.

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Pipet 5.0 ml from the "Intermediate Mercury Standard Solution" (6.2.4) into a 250-ml volumetric glass flask. Add 10 ml of the 5 percent H_2SO_4 and 2 ml of the 0.1 M ICl absorbing solution taken as a blank (7.2.3) and dilute to 250 ml with deionized distilled water. Mix thoroughly.

7. *Procedure*—7.1 *Sampling.* Because of the complexity of this method, testers should be trained and experienced with the test procedures to assure reliable results. Since the amount of Hg that is collected generally is small, the method must be carefully applied to prevent contamination or loss of sample.

7.1.1 *Pretest Preparation.* Follow the general procedure given in Method 5, Section 4.1.1, except omit the directions on the filter.

7.1.2 *Preliminary Determinations.* Follow the general procedure given in Method 5, Section 4.1.2, except as follows: Select a nozzle size based on the range of velocity heads to assure that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates below 28 liters/min (1.0 cfm).

Obtain samples over a period or periods that accurately determine the maximum emissions that occur in a 24-hour period. In the case of cyclic operations, run sufficient tests for the accurate determination of the emissions that occur over the duration of the cycle. A minimum sample time of 2 hours is recommended. In some instances, high Hg or high SO_2 concentrations make it impossible to sample for the desired minimum time. This is indicated by reddening (liberation of free iodine) in the first impinger. In these cases, the tester may divide the sample run into two or more subruns to insure that the absorbing solution is not depleted.

7.1.3 *Preparation of Sampling Train.* Clean all glassware [probe, impingers, and connectors] by rinsing with 50 percent HNO_3, tap water, 0.1 M ICl, tap water, and finally deionized distilled water. Place 100 ml of 0.1 M ICl in each of the first three impingers. Take care to prevent the absorbing solution from contacting any greased surfaces. Place approximately 200 g of preweighed silica gel in the fourth impinger. The tester may use more silica gel, but should be careful to ensure that it is not entrained and carried out from the impinger during sampling. Place the silica gel container in a clean place for later use in the sample recovery. Alternatively, determine and record the weight of the silica gel plus impinger to the nearest 0.5 g.

Install the selected nozzle using a Viton A O-ring when stack temperatures are less than 260° C (500° F). Use a fiberglass string gasket if temperatures are higher. See APTD-0576 (Citation 9 in Section 10) for details. Other connecting systems using either 316 stainless steel or Teflon ferrules may be used. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point. Assemble the train as shown in Figure 101-1, using (if necessary) a very light coat of silicone grease on all ground glass joints. Grease only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease.

NOTE: An empty impinger may be inserted between the third impinger and the silica gel to remove excess moisture from the sample stream.

After the sampling train has been assembled, turn on and set the probe, if applicable, at the desired operating temperature. Allow time for the temperatures to stabilize. Place crushed ice around the impingers.

7.1.4 *Leak-Check Procedures.* Follow the leak-check procedures outlined in Method 5, Sections 4.1.4.1 (Pretest Leak Check), 4.1.4.2 (Leak Checks During Sample Run), and 4.1.4.3 (Post-Test Leak Check).

7.1.5 *Mercury Train Operation.* Follow the general procedure given in Method 5, Section 4.1.5. For each run, record the data required on a data sheet such as the one shown in Figure 101-4.

7.1.6 *Calculation of Percent Isokinetic.* Same as Method 5, Section 4.1.6.

7.2 *Sample Recovery.* Begin proper cleanup procedure as soon as the probe is removed from the stack at the end of the sampling period.

Allow the probe to cool. When it can be safely handled, wipe off any external particulate matter near the tip of the probe nozzle and place a cap over it. Do not cap off the probe tip tightly while the sampling train is cooling. Capping would create a vacuum and draw liquid out from the impingers.

Before moving the sampling train to the cleanup site, remove the probe from the train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the impinger. Use either ground-glass stoppers, plastic caps, or serum caps to close these openings.

Transfer the probe and impinger assembly to a cleanup area that is clean, protected from the wind, and free of Hg contamination. The ambient air in laboratories located in the immediate vicinity of Hg-using facilities is not normally free of Hg contamination.

Inspect the train before and during assembly, and note any abnormal conditions. Treat the sample as follows:

7.2.1 *Container No. 1* (Impinger and Probe). Using a graduated cylinder, measure the liquid in the first three impingers to

within ±1 ml. Record the volume of liquid present (e.g., see Figure 5-3 of Method 5). This information is needed to calculate the moisture content of the effluent gas. (Use only glass storage bottles and graduated cylinders that have been precleaned as in Section 7.1:3.) Place the contents of the first three impingers into a 1000-ml glass sample bottle.

Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover the Hg (and any condensate) from the probe nozzle, probe fitting, and probe liner as follows: Rinse these components with two 50-ml portions of 0.1 M IC1. Next, rinse the probe nozzle, fitting and liner, and each piece of connecting glassware between the probe liner and the back half of the third impinger with a maximum of 400 ml of deionized distilled water. Add all washings to the 1000-ml glass sample bottle containing the liquid from the first three impingers.

After all washings have been collected in the sample container, tighten the lid on the container to prevent leakage during shipment to the laboratory. Mark the height of the liquid to determine later whether leakage occurred during transport. Label the container to clearly identify its contents.

7.2.2 *Container No. 2* (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from its impinger to its original container and seal. The tester may use as aids a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. The small amount of particles that may adhere to the impinger wall need not be removed. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g; record this weight.

7.2.3 *Container No. 3* (Absorbing Solution Blank). For a blank, place 50 ml of the 0.1 M IC1 absorbing solution in a 100-ml sample bottle. Seal the container. Use this blank to prepare the working mercury standard solution (6.2.5).

7.3 *Sample Preparation.* Check the liquid level in each container to see whether liquid was lost during transport. If a noticeable amount of leakage occurred, either void the sample or use methods subject to the approval of the Administrator to account for the losses. Then follow the procedures below:

7.3.1 *Container No. 1* (Impinger and Probe). Carefully transfer the contents of Container No. 1 into a 1000-ml volumetric flask and adjust the volume to exactly 1000 ml with deionized distilled water.

7.3.2 *Dilutions.* Pipet a 2-ml aliquot from the diluted sample from 7.3.1 into a 250-ml volumetric flask. Add 10 ml of 5 percent H_2SO_4 and adjust the volume to exactly 250 ml with deionized distilled water. These solutions are stable for at least 72 hours.

NOTE: The dilution factor will be 250/2 for this solution.

7.4 *Analysis.* Calibrate the spectrophotometer and recorder and prepare the calibration curve as described in Sections 8.1 to 8.4.

7.4.1 *Mercury Samples.* Repeat the procedure used to establish the calibration curve with appropriately sized aliquots (1 to 5 ml) of each of the diluted samples (from Section 7.3.2) until two consecutive peak heights agree within ±3 percent of their average value. The peak maximum of an aliquot (except the 5-ml aliquot) must be greater than 10 percent of the recorder full scale. If the peak maximum of a 1.0-ml aliquot is off scale on the recorder, further dilute the original source sample to bring the Hg concentration into the calibration range of the spectrophotometer.

Run a blank and standard at least after every five samples to check the spectrophotometer calibration; recalibrate as necessary.

It is also recommended that at least one sample from each stack test be checked by the method of standard additions to confirm that matrix effects have not interfered in the analysis.

7.4.2 *Container No. 2* (Silica Gel). Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. (This step may be conducted in the field.)

8. *Calibration and Standards*—Before use, clean all glassware, both new and used, as follows: brush with soap and water, liberally rinse with tap water, soak for 1 hour in 50 percent HNO_3, and then rinse with deionized distilled water.

8.1 *Flow Calibration.* Assemble the aeration system as shown in Figure 101-5. Set the outlet pressure on the aeration gas cylinder regulator to a minimum pressure of 500 mm Hg (10 psi), and use the flowmetering valve and a bubble flowmeter or wet test meter to obtain a flow rate of 1.5±0.1 liters/min through the aeration cell. After the flow calibration is complete, remove the bubble flowmeter from the system.

8.2 *Optical Cell Heating System Calibration.* Using a 50-ml graduated cylinder, add 50 ml of deionized distilled water to the bottle section of the aeration cell and attach the bottle section to the bubbler section of the cell. Attach the aeration cell to the optical cell; and while aerating at 1.5 liters/min, determine the minimum variable transformer setting necessary to prevent condensation of moisture in the optical cell and in the

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connecting tubing. (This setting should not exceed 20 volts.)

8.3 *Spectrophotometer and Recorder Calibration.* The mercury response may be measured by either peak height or peak area.

NOTE: The temperature of the solution affects the rate at which elemental Hg is released from a solution and, consequently, it affects the shape of the absorption curve (area) and the point of maximum absorbance (peak height). Therefore, to obtain reproducible results, bring all solutions to room temperature before use.

Set the spectrophotometer wavelength at 253.7 nm, and make certain the optical cell is at the minimum temperature that will prevent water condensation. Then set the recorder scale as follows: Using a 50-ml graduated cylinder, add 50 ml of deionized distilled water to the aeration cell bottle and pipet 5.0 ml of the working mercury standard solution into the aeration cell.

NOTE: Always add the Hg-containing solution to the aeration cell after the 50 ml of deionized distilled water.

Place a Teflon-coated stirring bar in the bottle. Before attaching the bottle section to the bubbler section of the aeration cell, make certain that (1) the aeration cell exit arm stopcock (Figure 101-3) is closed (so that Hg will not prematurely enter the optical cell when the reducing agent is being added) and (2) there is no flow through the bubbler. If conditions (1) and (2) are met, attach the bottle section to the bubbler section of the aeration cell through the side arm of the cell and immediately stopper the side arm. Stir the solution for 15 sec, turn on the recorder, open the aeration cell exit arm stopcock, and then immediately initiate aeration with continued stirring. Determine the maximum absorbance of the standard and set this value to read 90 percent of the recorder full scale.

8.4 *Calibration Curve.* After setting the recorder scale, repeat the procedure in Section 8.3 using 0.0-, 1.0-, 2.0-, 3.0-, 4.0-, and 5.0-ml aliquots of the working standard solution (final amount of Hg in the aeration cell is 0, 200, 400, 600, 800, and 1000 ng, respectively). Repeat this procedure on each aliquot size until two consecutive peaks agree within 3 percent of their average value. (Note: To prevent Hg carryover from one sample to another, do not close the aeration gas tank valve and do not disconnect the aeration cell from the optical cell until the recorder pen has returned to the baseline.) It should not be necessary to disconnect the aeration gas inlet line from the aeration cell when changing samples. After separating the bottle and bubbler sections of the aeration cell, place the bubbler section into a 600-ml beaker containing approximately 400 ml of deionized distilled water. Rinse the bottle section of the aeration cell with a stream of deionized distilled water to remove all traces of the tin (II) reducing agent. Also, to prevent the loss of Hg before aeration, remove all traces of the reducing agent between samples by washing with deionized distilled water. It will be necessary, however, to wash the aeration cell parts with concentrated HCl if any of the following conditions occur: (1) A white film appears on any inside surface of the aeration cell, (2) the calibration curve changes suddenly, or (3) the replicate samples do not yield reproducible results.

Subtract the average peak height (or peak area) of the blank (0.0-ml aliquot)—which should be less than 2 percent of recorder full scale—from the averaged peak heights of the 1.0-, 2.0-, 3.0-, 4.0-, and 5.0-ml aliquot standards. If the blank absorbance is greater than 2 percent of full-scale, the probable cause is Hg contamination of a reagent or carry-over of Hg from a previous sample. Plot the corrected peak height of each standard solution versus the corresponding final total Hg weight in the aeration cell (in ng) and draw the best-fit straight line. This line should either pass through the origin or pass through a point no further from the origin than ±2 percent of the recorder full scale. If the line does not pass through or very near to the origin, check for nonlinearity of the curve and for incorrectly prepared standards.

8.5 *Sampling Train Calibration.* Calibrate the sampling train components according to the procedures outlined in the following sections of Method 5: Section 5.1 (Probe Nozzle), Section 5.2 (Pitot Tube), Section 5.3 (Metering System), Section 5.4 (Probe Heater), Section 5.5 (Temperature Gauges), Section 5.7 (Barometer). Note that the leak-check described in Section 5.6 of Method 5 applies to this method.

9. *Calculations*—9.1 *Dry Gas Volume.* Using the data from this test, calculate $V_{m(std)}$, the dry gas sample volume at standard conditions (corrected for leakage, if necessary) as outlined in Section 6.3 of Method 5.

9.2 *Volume of Water Vapor and Moisture Content.* Using the data obtained from this test, calculate the volume of water vapor $V_{w(std)}$ and the moisture content B_{ws}, of the stack gas. Use Equations 5-2 and 5-3 of Method 5.

9.3 *Stack Gas Velocity.* Using the data from this test and Equation 2-9 of Method 2, calculate the average stack gas velocity v_s.

9.4 *Total Mercury.* For each source sample, correct the average maximum absorbance of the two consecutive samples whose peak heights agree within ±3 percent of their average for the contribution of the solution blank (see Section 8.4). Use the calibration curve and these corrected aver-

ages, to determine the final total weight of mercury in nanograms in the aeration cell for each source sample. Correct for any dilutions made to bring the sample in the working range of the spectrophotometer. Then calculate the Hg in μg (m_{Hg}) in the original solution as follows:

$$M_{Hg} = \frac{C_{Hg(AC)}(D.F.)V_t 10^{-3}}{S}$$

Eq. 101-1

Where:

$C_{Hg(AC)}$ = Total nanograms of mercury in aliquot analyzed (reagent blank subtracted).

D.F. = Dilution factor for the Hg-containing solution (before adding to the aeration cell; e.g., D.F. = 250/2 if the source samples were diluted as described in Section 7.3.2.)

V_t = Solution volume of original sample, 1000 ml for samples diluted as described in Section 7.2.1.

10^{-3} = Conversion factor, μg/ng.

S = Aliquot volume added to aeration cell, ml.

9.5 *Mercury Emission Rate.* Calculate the Hg emission rate R in g/day for continuous operations using Equation 101-2. For cyclic operations, use only the time per day each stack is in operation. The total Hg emission rate from a source will be the summation of results from all stacks.

$$R = K \frac{m_{Hg} v_s A_s (86{,}400 \times 10^{-9})}{[V_{m(std)} + V_{w(std)}](T_s/P_s)}$$

Eq. 101-2

Where:

A_s = Stack cross-sectional area, m^2 (ft^2).

86,400 = Conversion factor, sec/day.

10^{-9} = Conversion factor, g/μg.

T_s = Absolute average stack gas temperature, °K (°R).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).

K = 0.3858 °K/mm Hg for metric units.
= 17.65 °R/in. Hg for English units.

9.6 *Isokinetic Variation and Acceptable Results.* Same as Method 5, Sections 6.11 and 6.12, respectively.

9.7 *Determination of Compliance.* Each performance test consists of three repetitions of the applicable test method. For the purpose of determining compliance with an applicable national emission standard, use the average of the results of all repetitions.

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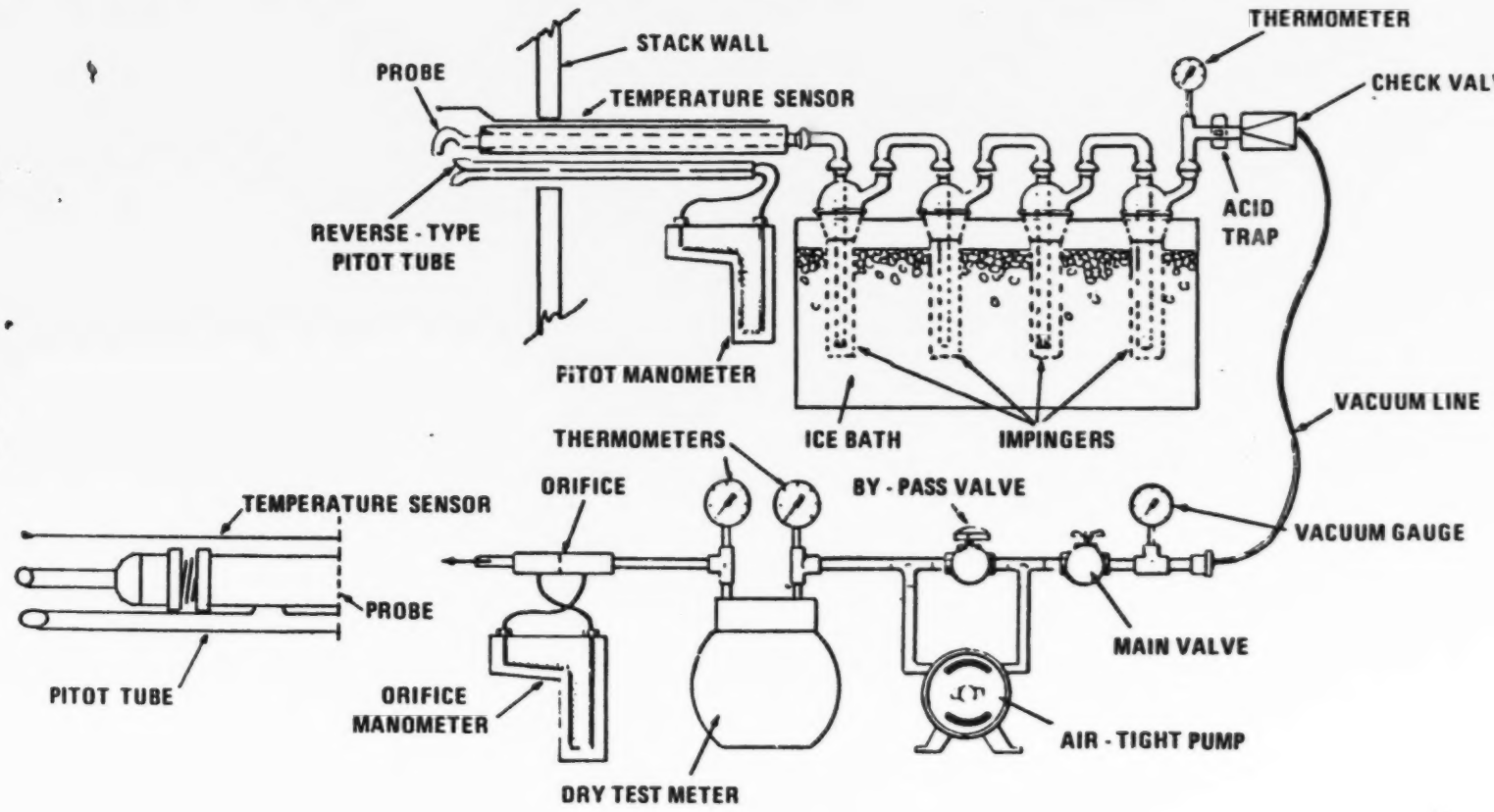

Figure 101-1 Mercury sampling train.

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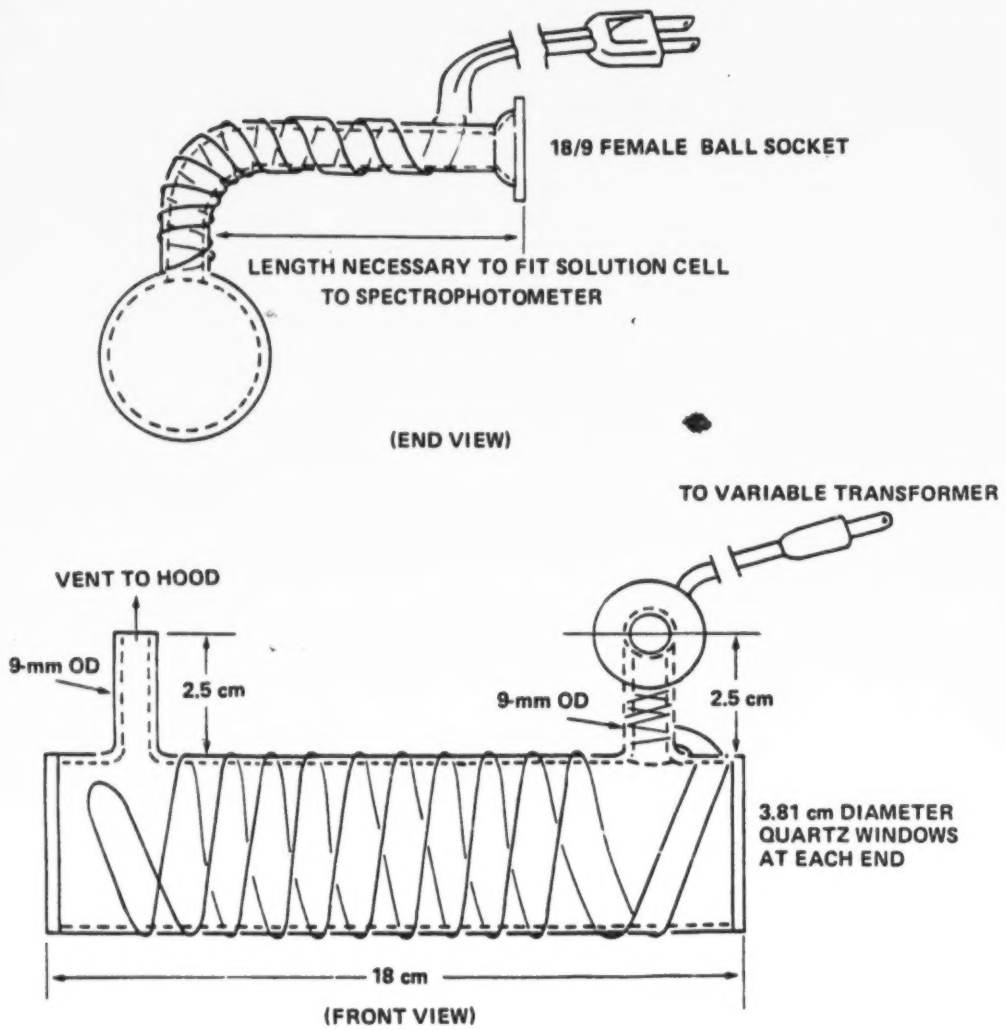

NOTES:
CELL WOUND WITH 24-GAUGE NICHROME WIRE
TOLERANCES ± 5 PERCENT

Figure 101-2. Optical cell.

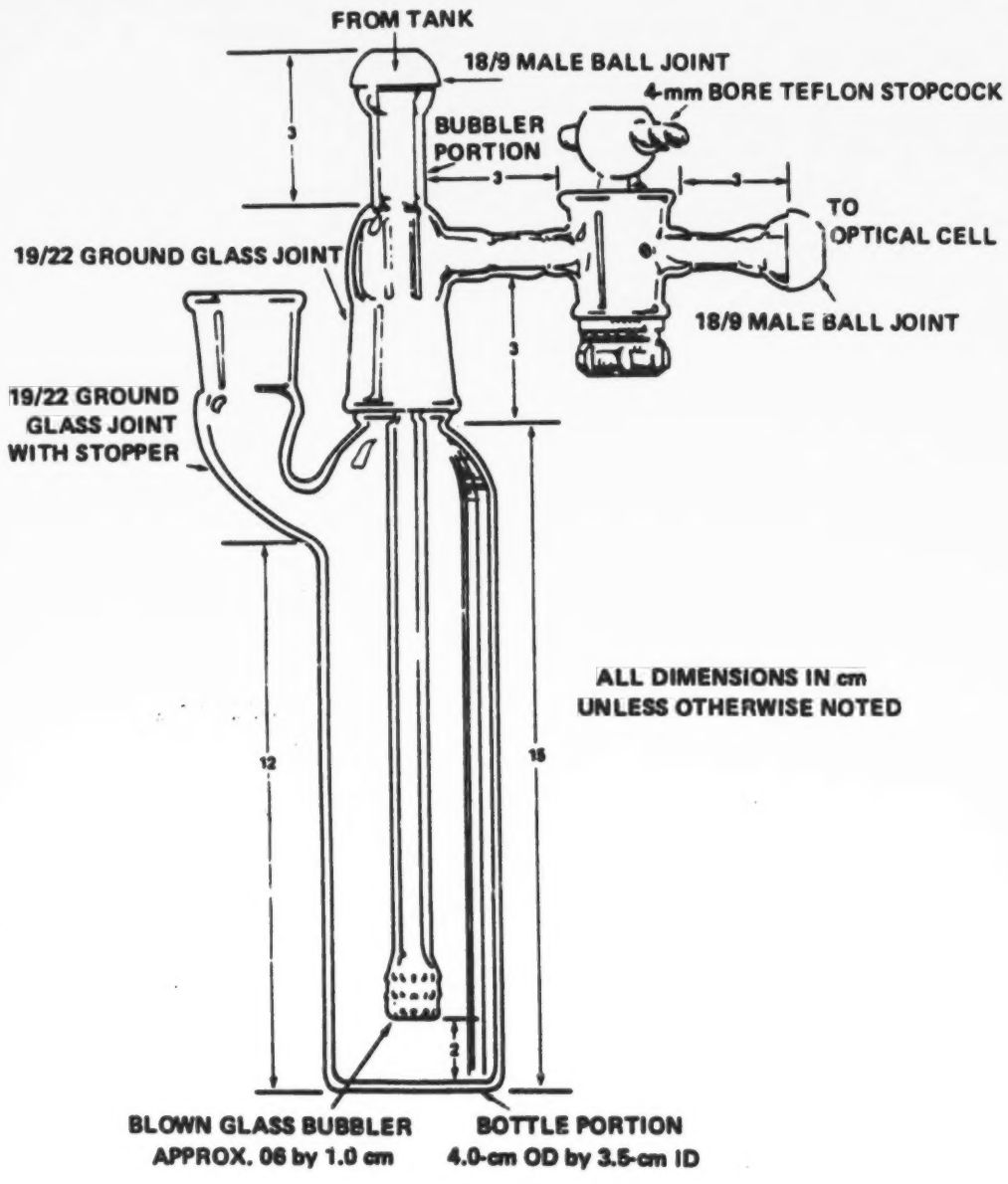

Figure 101-3. Aeration cell.

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PLANT _____
LOCATION _____
OPERATOR _____
DATE _____
RUN NO. _____
SAMPLE BOX NO. _____
FILTER BOX NO. _____
METER ΔH@ _____
C FACTOR _____
PITOT TUBE COEFFICIENT, C_p _____

SCHEMATIC OF STACK CROSS SECTION

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, m (ft) _____
NOZZLE IDENTIFICATION NO. _____
AVERAGE CALIBRATED NOZZLE DIAMETER, cm (in.) _____
PROBE HEATER SETTING* _____
LEAK RATE, m^3/min (cfm) _____
PROBE LINER MATERIAL _____
STATIC PRESSURE, mm Hg (in. Hg) _____
FILTER NO.* _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min	VACUUM mm Hg (in. Hg)	STACK TEMPERATURE (Ts) °C (°F)	VELOCITY HEAD (Δp) mm H2O (in. H2O)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER mm H2O (in. H2O)	GAS SAMPLE VOLUME m³ (ft³)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		FILTER HOLDER* TEMPERATURE °C (°F)	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °C (°F)
							INLET °C (°F)	OUTLET °C (°F)		
TOTAL							Avg.	Avg.		
AVERAGE							Avg.			

*If applicable

Fig. 10-41. Velocity field data.

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Figure 1B15. Schematic of aeration system.

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METHOD 101A—DETERMINATION OF PARTICULATE AND GASEOUS MERCURY EMISSIONS FROM SEWAGE SLUDGE INCINERATORS

INTRODUCTION

This method is similar to Method 101, except acidic potassium permangante solution is used instead of acidic iodine monochloride for collection.

1. *Applicability and Principle*—1.1 *Applicability.* This method applies to the determination of particulate and gaseous mercury (Hg) emissions from sewage sludge incinerators and other sources as specified in the regulations.

1.2 *Principle.* Particulate and gaseous Hg emissions are withdrawn isokinetically from the source and collected in acidic potassium permanganate ($KMnO_4$) solution. The Hg collected (in the mercuric form) is reduced to elemental Hg, which is then aerated from the solution into an optical cell and measured by atomic absorption spectrophotometry.

2. *Range and Sensitivity*—2.1 *Range.* After initial dilution, the range of this method is 20 to 800 ng Hg/ml. The upper limit can be extended by further dilution of the sample.

2.2 *Sensitivity.* The sensitivity of the method depends on the recorder/spectrophotometer combination selected.

3. *Interfering Agents*—3.1 *Sampling.* Excessive oxidizable organic matter in the stack gas prematurely depletes the $KMnO_4$ solution and thereby prevents further collection of Hg.

3.2 *Analysis.* Condensation of water vapor on the optical cell windows causes a positive interference.

4. *Precision*—Based on eight paired-train tests, the within-laboratory standard deviation was estimated to be 4.8 μg Hg/ml in the concentration range of 50 to 130 μg Hg/m^3.

5. *Apparatus*—5.1 *Sampling Train and Sample Recovery.* Same as Method 101, Sections 5.1 and 5.2, respectively, except for the following variations:

5.1.1 *Probe Liner.* Same as Method 101, Section 5.1.2, except that if a filter is used ahead of the impingers, the tester must use the probe heating system to minimize the condensation of gaseous Hg.

5.1.2 *Filter Holder (Optional).* Borosilicate glass with a rigid stainless-steel wire-screen filter support (do not use glass frit supports) and a silicone rubber of Teflon gasket, designed to provide a positive seal against leakage from outside or around the filter. The filter holder must be equipped with a filter heating system capable of maintaining a temperature around the filter holder of 120 ± 15° C (248 ± 25° F) during sampling to minimize both water and gaseous Hg condensation. The tester may use a filter in cases where the stream contains large quantities of particulate matter.

5.2 *Analysis.* The apparatus needed for analysis is the same as Method 101, Sections 5.3 and 5.4, except as follows:

5.2.1 *Volumetric Pipets.* Class A; 1-, 2-, 3-, 4-, 5-, 10-, and 20-ml.

5.2.2 *Graduated Cylinder.* 25-ml.

5.2.3 *Steam Bath.*

6. *Reagents—Use ACS reagent-grade chemicals or equivalent, unless otherwise specified.*

6.1 *Sampling and Recovery.* The reagents used in sampling and recovery are as follows:

6.1.1 *Water.* Deionized distilled, meeting ASTM Specifications for Type I Reagent Water—ASTM Test Method D 1193-74. If high concentrations of organic matter are not expected to be present, the analyst may eliminate the $KMnO_4$ test for oxidizable organic matter. Use this water in all dilutions and solution preparations.

6.1.2 *Nitric Acid (HNO_3), 50 Percent (V/V).* Mix equal volumes of concentrated HNO_3 and deionized distilled water, being careful to slowly add the acid to the water.

6.1.3 *Silica Gel.* Indicating type, 6- to 16-mesh. If previously used, dry at 175° C (350° F) for 2 hr. The tester may use new silica gel as received.

6.1.4 *Filter (Optional).* Glass fiber filter, without organic binder, exhibiting at least 99.95 percent efficiency on 0.3 μm dioctyl phthalate smoke particles. The tester may use the filter in cases where the gas stream contains large quantities of particulate matter, but he should analyze blank filters for Hg content.

6.1.5 *Sulfuric Acid (H_2SO_4), 10 Percent (V/V).* Add and mix 100 ml of concentrated H_2SO_4 with 900 ml of deionized distilled water.

6.1.6 *Absorbing Solution, 4 Percent $KMnO_4$ (W/V).* Prepare fresh daily. Dissolve 40 g of $KMnO_4$ in sufficient 10 percent H_2SO_4 to make 1 liter. Prepare and store in glass bottles to prevent degradation.

6.2 *Analysis.* The reagents needed for analysis are listed below:

6.2.1 *Tin (II) Solution.* Prepare fresh daily and keep sealed when not being used. Competely dissolve 20 g of tin (II) chloride [or 25 g of tin (II) sulfate] crystals (Baker Analyzed reagent grade or any other brand that will give a clear solution) in 25 ml of concentrated HCl. Dilute to 250 ml with deionized distilled water. Do not substitute HNO_3, H_2SO_4, or other strong acids for the HCl.

6.2.2 *Sodium Chloride—Hydroxylamine Solution.* Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulfate (or 12 g of hydroxylamine hydrochloride) in deionized distilled water and dilute to 100 ml.

6.2.3 *Hydrochloric Acid (HCl), 8 N.* Dilute 67 ml of concentrated HNO_3 to 100 ml with deionzed distilled water (slowly add the HCl to the water).

6.2.4 *Nitric Acid, 15 Percent (V/V).* Dilute 15 ml of concentrated HNO_3 to 100 ml with deionized distilled water.

6.2.5 *Mercury Stock Solution, 1 mg Hg/ml.* Prepare and store all mercury standard solutions in borosilicate glass containers. Completely dissolve 0.1354 g of mercury (II) chloride in 75 ml of deionized distilled water. Add 100 ml of concentrated HNO_3, and adjust the volume to exactly 100 ml with deionized distilled water. Mix thoroughly. This solution is stable for at least 1 month.

6.2.6 *Intermediate Mercury Standard Solution, 10 μg Hg/ml.* Prepare fresh weekly. Pipet 5.0 ml of the mercury stock solution (Section 6.2.5) into a 500-ml volumetric flask and add 20 ml of 15 percent HNO_3 solution. Adjust the volume to exactly 500 ml with deionized distilled water. Thoroughly mix the solution.

6.2.7 *Working Mercury Standard Solution, 200 ng Hg/ml.* Prepare fresh daily. Pipet 5.0 ml from the "Intermediate Mercury Standard Solution" (Section 6.2.6) into a 250-ml volumetric flask. Add 5 ml of 4 percent $KMnO_4$ absorbing solution and 5 ml of 15 percent HNO_3. Adjust the volume to exactly 250 ml with deionized distilled water. Mix thoroughly.

6.2.8 *Potassium Permanganate, 5 Percent (W/V).* Dissolve 5 g of $KMnO_4$ in deionized distilled water and dilute to 100 ml.

6.2.9 *Filter.* Whatman No. 40 or equivalent.

7. *Procedure*—7.1 *Sampling.* The sampling procedure is the same as Method 101, except for changes due to the use of $KMnO_4$ instead of ICl absorbing solution and the possible use of a filter. These changes are as follows:

7.1.1 *Preliminary Determinations.* The preliminary determinations are the same as those given in Method 101, Section 7.1.2, except for the absorbing solution depletion sign. In this method, high oxidizable organic content may make it impossible to sample for the desired minimum time. This problem is indicated by the complete bleaching of the purple color of the $KMnO_4$ solution. In these cases, the tester may divide the sample run into two or more subruns to insure that the absorbing solution would not be depleted. In cases where an excess of water condensation is encountered, collect two runs to make one sample.

7.1.2 *Preparation of Sampling Train.* The preparation of the sampling train is the same as that given in Method 101, Section 7.1.3, except for the cleaning of the glassware [probe, filter holder (if used), impingers, and connectors] and the charging of the first three impingers. In this method, clean all the glass components by rinsing with 50 percent HNO_3, tap water, 8 N HCl, tap water, and finally deionized distilled water. Then place 50 ml of 4 percent $KMnO_4$ in the first impinger and 100 ml in each of the second and third impingers.

If a filter is used, use a pair of tweezers to place the filter in the filter holder. Be sure to center the filter and place the gasket in proper position to prevent the sample gas stream from by-passing the filter. Check the filter for tears after assembly is completed. Be sure also to set the filter heating system at the desired operating temperature after the sampling train has been assembled.

7.1.3 *Sampling Train Operation.* In addition to the procedure given in Method 101, Section 7.1.5, maintain a temperature around the filter (if applicable) of 120° ±14° C (248° ±25° F).

7.2 *Sample Recovery.* Begin proper cleanup procedure as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When it can be safely handled, wipe off any external particulate matter near the tip of the probe nozzle and place a cap over it. Do not cap off the probe tip tightly while the sampling train is cooling because the resultant vacuum would draw liquid out from the impingers.

Before moving the sample train to the cleanup site, remove the probe from the train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the impinger. Use either ground-glass stoppers, plastic caps, or serum caps to close these openings.

Transfer the probe, impinger assembly, and (if applicable) filter assembly to a cleanup area that is clean, protected from the wind, and free of Hg contamination. The ambient air in laboratories located in the immediate vicinity of Hg-using facilities is not normally free of Hg contamination.

Inspect the train before and during assembly, and note any abnormal conditions. Treat the sample as follows:

7.2.1 *Container No. 1* (Impinger, Probe, and Filter Holder). Use a graduated cylinder; measure the liquid in the first three impingers to within ±1 ml. Record the volume of liquid present (e.g., see Figure 5-3 of Method 5 in Part 60 of 40 CFR). This information is needed to calculate the moisture content of the effluent gas. (Use only graduated cylinder and glass storage bottles that have been precleaned as in Section 7.1.2.) Place the contents of the first three impingers into a 1000-ml glass sample bottle.

(NOTE: If a filter is used, remove the filter from its holder, as outlined under "Container No. 3" below.)

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Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover the Hg (and any condensate) from the probe nozzle, probe fitting, probe liner and front half of the filter holder (if applicable) as follows: Rinse these components with a total of 250 to 400 ml of fresh 4 percent $KMnO_4$ solution; add all washings to the 1000-ml glass sample bottle; remove any residual brown deposits on the glassware using the minimum amount of 8 N HCl required; and add this HCl rinse to this sample container.

After all washings have been collected in the sample container, tighten the lid on the container to prevent leakage during shipment to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to clearly identify its contents.

7.2.2. *Container No. 2* (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from its impinger to its original container and seal. The tester may use as aids a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g; record this weight.

7.2.3 *Container No. 3* (Filter). If a filter was used, carefully remove it from the filter holder, place it in a 100-ml glass sample bottle, and add 20 to 40 ml of 4 percent $KMnO_4$. If it is necessary to fold the filter, be sure that the particulate cake is inside the fold. Carefully transfer to the 150-ml sample bottle any particulate matter and filter fibers that adhere to the filter holder gasket by using a dry Nylon bristle brush and a sharp-edged blade. Seal the container. Label the container to clearly identify its contents. Mark the height of the fluid level to determine whether leakage occurs during transport.

7.2.4 *Container No. 4* (Filter Blank). If a filter was used, treat an unused filter from the same filter lot used for sampling in the same manner as Container No. 3.

7.2.5 *Container No. 5* (Absorbing Solution Blank). For a blank, place 500 ml of 4 percent $KMnO_4$ absorbing solution in a 1000-ml sample bottle. Seal the container.

7.3 *Sample Preparation.* Check liquid level in each container to see if liquid was lost during transport. If a noticeable amount of leakage occurred, either void the sample or use methods subject to the approval of the Administrator to account for the losses. Then follow the procedures below.

7.3.1 *Containers No. 3 and No. 4* (Filter and Filter Blank). If a filter was used, place the contents, including the filter, of Containers No. 3 and No. 4 in separate 250-ml beakers and heat the beakers on a steam bath until most of the liquid has evaporated. Do not take to dryness. Add 20 ml of concentrated HNO_3 to the beakers, cover them with a glass, and heat on a hot plate at 70° C for 2 hours. Remove from the hot plate and filter the solution through Whatman No. 40 filter paper. Save the filtrate for Hg analysis. Discard the filter.

7.3.2 *Container No. 1* (Impingers, Probe, and Filter Holder). Filter the contents of Container No. 1 through Whatman 40 filter paper to remove the brown MnO_2 precipitate. Wash the filter with 50 ml of 4 percent $KMnO_4$ absorbing solution and add this wash to the filtrate. Discard the filter. Combine the filtrates from Containers No. 1 and No. 3 (if applicable), and dilute to a known volume with deionized distilled water. Mix thoroughly.

7.3.3 *Container No. 5* (Absorbing Solution Blank). Treat this container as described in Section 7.3.2. Combine this filtrate with the filtrate with Container No. 4 and dilute to a known volume with deionized distilled water. Mix thoroughly.

7.4 *Analysis.* Calibrate the spectrophotometer and recorder and prepare the calibration curve as described in Sections 8.1 to 8.4. Then repeat the procedure used to establish the calibration curve with appropriately sized aliquots (1 to 10 ml) of the samples (from Sections 7.3.2 and 7.3.3) until two consecutive peak heights agree within ±3 percent of their average value. If the 10-ml sample is below the detectable limit, use a larger aliquot (up to 20 ml), but decrease the volume of water added to the aeration cell accordingly to prevent the solution volume from exceeding the capacity of the aeration bottle. If the peak maximum of a 1.0-ml aliquot is off scale, further dilute the original sample to bring the Hg concentration into the calibration range of the spectrophotometer. If the Hg content of the absorbing solution and filter blank is below the working range of the analytical method, use zero for the blank.

Run a blank and standard at least after every five samples to check the spectrophotometer calibration; recalibrate as necessary.

It is also recommended that at least one sample from each stack test be checked by the Method of Standard Additions to confirm that matrix effects have not interfered in the analysis.

8. *Calibration and Standards*—The calibration and standards are the same as

Method 101, Section 8, except for the following variations:

8.1 *Optical Cell Heating System Calibration.* Same as method 101, Section 8.2, except use a 25-ml graduated cylinder to add 25 ml of deionized distilled water to the bottle section of the aeration cell.

8.2 *Spectrophotometer and Recorder Calibration.* The mercury response may be measured by either peak height or peak area. (NOTE: the temperature of the solution affects the rate at which elemental Hg is released from a solution and, consequently, it affects the shape of the absorption curve (area) and the point of maximum absorbance (peak height). To obtain reproducible results, all solutions must be brought to room temperature before use.) Set the spectrophotometer wave length at 253.7 nm and make certain the optical cell is at the minimum temperature that will prevent water condensation.

Then set the recorder scale as follows: Using a 25-ml graduated cylinder, add 25 ml of deionized distilled water to the aeration cell bottle and pipet 5.0 ml of the working mercury standard solution into the aeration cell. (NOTE: Always add the Hg-containing solution to the aeration cell after the 25 ml of deionized distilled water.) Place a Teflon-coated stirring bar in the bottle. Add 5 ml of the 4 percent $KMnO_4$ absorbing solution followed by 5 ml of 15 percent HNO_3 and 5 ml of 5 percent $KMnO_4$ to the aeration bottle and mix well. Now, attach the bottle section to the bubbler section of the aeration cell and make certain that (1) the aeration cell exit arm stopcock (Figure 101-3 of Method 101) is closed (so that Hg will not prematurely enter the optical cell when the reducing agent is being added) and (2) there is no flow through the bubbler. Add 5 ml of sodium chloride hydroxylamine in 1-ml increments until the solution is colorless. Now add 5 ml of tin (II) solution to the aeration bottle through the side arm. Stir the solution for 15 seconds, turn on the recorder, open the aeration cell exit arm stopcock, and immediately initiate aeration with continued stirring. Determine the maximum absorbance of the standard and set this value to read 90 percent of the recorder full scale.

9. *Calculations*—9.1 *Dry Gas Volume, Volume of Water Vapor and Moisture Content, Stack Gas Velocity, Isokinetic Variation and Acceptable Results, and Determination of Compliance.* Same as Method 101, Sections 9.1, 9.2, 9.3, 9.6, and 9.7, respectively, except use data obtained from this test.

9.2 *Total Mercury.* For each source sample, correct the average maximum absorbance of the two consecutive samples whose peak heights agreed within ±3 percent of their average for the contribution of the field blank. Then calculate the total Hg content in μg in each sample. Correct for any dilutions made to bring the sample into the working range of the spectrophotometer.

9.3 *Mercury Emission Rate.* Calculate the Hg emission rate R in g/day for continuous operations using Equation 101A-1. For cyclic operations, use only the time per day each stack is in operation. The total Hg emission rate from a source will be the summation of results from all stacks.

$$R = K \frac{m_{Hg} v_s A_s (86{,}400 \times 10^{-9})}{[V_{m(std)} + V_{w(std)}](T_s/P_s)}$$

Eq. 101A-1

Where:

m_{Hg} = Total Hg content in each sample, μg.
v_s = Average stack gas velocity, m/sec (fps).
A_s = Stack cross-sectional area, m^2 (ft^2).
86,400 = Conversion factor, sec/day.
10^{-6} = Conversion factor, g/μg.
$V_{m(std)}$ = Dry gas sample volume at standard conditions, corrected for leakage (if any), m^3 (ft^3).
$V_{w(std)}$ = Volume of water vapor at standard conditions, m^3 (ft^3).
T_s = Absolute average stack gas temperature, °K (°R).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
K = 0.3858 °K/mm Hg for metric units.
= 17.64 °R/in. Hg for English units.

10. *Bibliography.* 1. Same as Method 101, Section 10.

2. Mitchell, W. J., M. R. Midgett, J. C. Suggs, and D. Albrinck.
Test Methods to Determine the Mercury Emissions from Sludge Incineration Plants. U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. Publication No. EPA-600/4-79-058. September 1979.

METHOD 102—DETERMINATION OF PARTICULATE AND GASEOUS MERCURY EMISSIONS FROM CHLOR-ALKALI PLANTS—HYDROGEN STREAMS

1. *Introduction*—Although similar to Method 101, Method 102 requires changes to accommodate the sample being extracted from a hydrogen stream. Conduct the test according to Method 101, except as shown below:

2. *Mercury Train Operation*—2.1 *Probe Heating System.* Do not use, unless otherwise specified.

2.2 *Glass Fiber Filter.* Do not use, unless otherwise specified.

2.3 *Safety Procedures.* The sampler must conduct the source test under conditions of utmost safety, because hydrogen and air

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mixtures are explosive. Since the sampling train essentially is leakless, attention to safe operation can be concentrated at the inlet and outlet. If a leak does occur, however, remove the meter box cover to avoid a possible explosive mixture. The following specific precautions are recommended:

2.3.1 *Operate only the vacuum pump during the test.* The other electrical equipment, e.g., heaters, fans, and timers, normally are not essential to the success of a hydogen stream test.

2.3.2 *Seal the sample port to minimize leakage of hydrogen from the stack.*

2.3.3 *Vent sampled hydrogen at least 3 m (10 feet) away from the train.* This can be accomplished by attaching a 13-mm-ID (0.50-in) Tygon tube to the exhaust from the orifice meter. (NOTE: A smaller ID tubing may cause the orifice meter calibration to be erroneous.) Take care to ensure that the exhaust line is not bent or pinched.

2.4 *Setting of Isokinetic Rates.*

2.4.1 If a nomograph is used, take special care in the calculation of the molecular weight of the stack gas and in the setting of the nomograph to maintain isokinetic conditions during sampling (Sections 2.4.1.1 through 2.4.1.3 below).

2.4.1.1 *Calibrate the meter box orifice.* Use the techniques described in APTD-0576 (see Citation 9 in Section 10 of Method 101). Calibration of the orifice meter at flow conditions that simulate the conditions at the source is suggested. Calibration should either be done with hydrogen or with some other gas having a similar Reynolds Number so that there is similarity between the Reynolds Numbers during calibration and during sampling.

2.4.1.2 The nomograph described in APTD-0576 cannot be used to calculate the C factor because the nomograph is designed for use when the stack gas dry molecular weight is 20±4. Instead, the following calculation should be made to determine the proper C factor:

$$C = 0.00154\Delta H_@ C_p^2 T_m (P_s/P_m) \frac{(1-B_{ws})^2}{(1-B_{ws}) + 18B_{ws}/M_d}$$

Where:

$\Delta H_@$ = Meter box calibration factor obtained in Section 2.4.1.1, in. H_2O.

C_p = Pitot tube calibration coefficient, dimensionless.

T_m = Absolute temperature of gas at the orifice, °R.

P_s = Absolute pressure of stack gas, in Hg.

P_m = Absolute pressure of gas at the meter, in Hg.

B_{ws} = Fraction by volume of water vapor in the stack gas.

M_d = Dry molecular weight of stack gas, lb/lb-mole.

NOTE. This calculation is left in English units, and is not converted to metric units because nomographs are based on English units.

2.4.1.3 Set the calculated C factor on the operating nomograph and select the proper nozzle diameter and K factor as specified in APTD-0576. If the C factor obtained in Section 2.4.1.2 exceeds the values specified on the existing operating nomograph, expand the C scale logarithmically so that the values can be properly located.

2.4.2 If a calculator is used to set isokinetic rates, it is suggested that the isokinetic equation presented in Citation 17 in the Bibliography of Method 101 be used.

2.5 Sampling in Small (<12-in.-Diameter) Stacks. When the stack diameter (or equivalent diameter) is less than 12 inches, conventional pitot tube-probe assemblies should not be used. For sampling guidelines, see Citation 18 in the Bibliography of Method 101.

METHOD 103—BERYLLIUM SCREENING METHOD

1. *Principle and applicability.*—1.1 *Principle.*—Beryllium emissions are isokinetically sampled from three points in a duct or stack. The collected sample is analyzed for beryllium using an appropriate technique.

1.2 *Applicability.*—This procedure details guidelines and requirements for methods acceptable for use in determining beryllium emissions in ducts or stacks at stationary sources, as specified under the provisions of § 61.14 of the regulations.

2. *Apparatus*—2.1 *Sampling train.*—A schematic of the required sampling train configuration is shown in figure 103-1. The essential components of the train are the following:

2.1.1 *Nozzle.*—Stainless steel, or equivalent, with sharp, tapered leading edge.

2.1.2 *Probe.*—Sheathed Pyrex[1] glass.

2.1.3 *Filter.*—Millipore AA, or equivalent, with appropriate filter holder that provides a positive seal against leakage from outside or around the filter. It is suggested that a Whatman 41, or equivalent, be placed immediately against the back side of the Millipore filter as a guard against breakage of the Millipore. Include the Whatman 41 in the analysis. Equivalent filters must be at least 99.5 percent efficient (DOP Test) and amenable to the analytical procedure.

2.1.4 *Meter-pump system.*—Any system that will maintain isokinetic sampling rate, determine sample volume, and is capable of a sampling rate of greater than 0.5 cfm.

2.2 *Measurement of stack conditions-(stack pressure, temperature, moisure and*

[1]Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

velocity).—The following equipment shall be used in the manner specified in section 4.3.1.

2.2.1 *Pitot tube.*—Type S, or equivalent, with a coefficient within 5 percent over the working range.

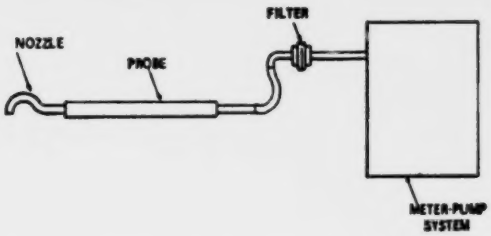

Figure 103-1. Beryllium screening method: sample train schematic.

2.2.2 *Differential pressure gauge.*—Inclined manometer, or equivalent, to measure velocity head to within 10 percent of the minimum value.

2.2.3 *Temperature gauge.*—Any temperature measuring device to measure stack temperture to within 5° F.

2.2.4 *Pressure gauge.*—Any device to measure stack pressure to within 0.1 in Hg.

2.2.5 *Barometer.—To measure atmospher-eic pressure to within 0.1 in. Hg.*

2.2.6 *Moisture determination.*—Wet and dry bulb thermometers, drying tubes, condensers, or equivalent, to determine stack gas moisture content to within 1 percent.

2.3 *Sample recovery.*—2.3.1 *Probe cleaning equipment.*—Probe brush or cleaning rod at least as long as probe, or equivalent. Clean cotton balls, or equivalent, should be used with the rod.

2.3.2 *Leakless glass sample bottles.*

2.4 *Analysis.*—2.4.1 Equipment necessary to perform an atomic absorption, spectrographic, flurometric, chromatographic, or equivalent analysis.

3. *Reagents.*—3.1 *Sample recovery.*—3.1.1 *Acetone.*—Reagent grade.

3.1.2 *Wash acid.*—1:1 V/V hydrochloric acid-water.

3.2 *Analysis.*—3.2.1 Reagents as necessary for the selected analytical procedure.

4. *Procedure.*—4.1 Guidelines for source testing are detailed in the following sections. These guidelines are generally applicable; however, most sample sites differ to some degree and temporary alterations such as stack extensions or expansion often are required to insure the best possible sample site. Further, since beryllium is hazardous, care should be taken to minimize exposure. Finally, since the total quantity of beryllium to be collected is quite small, the test must be carefully conducted to prevent contamination or loss of sample.

4.2 *Selection of a sampling site and number of runs.*—4.2.1 Select a suitable sampling site that is as close as practicable to the point of atmospheric emission. If possible, stack smaller than 1 foot in diameter should not be sampled.

4.2.2 The sampling site should be at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion or contraction. For rectangular cross-section, determine an equivalent diameter using the following equation:

$$D_e = 2LW/L+W \qquad \text{eq. 103-1}$$

where:

D_e = equivalent diameter
L = length
W = width

4.2.3 Some sampling situations may render the above sampling site criteria impractical. When this is the case, an alternate site may be selected but must be no less than two diameters downstream and one-half diameter upstream from any point of disturbance. Additional sample runs are recommended at any sample site not meeting the criteria of section 4.2.2.

4.2.4 Three runs shall constitute a test. The runs shall be conducted at three different points. The three points shall proportionately divide the diameter, i.e., be located at 25, 50 and 75 percent of the diameter from the inside wall. For horizontal ducts, the diameter shall be in the vertical direction. For rectangular ducts, sample on a line through the centroid and parallel to a side. If additional runs are required per section 4.2.3, proportionately divide the duct to accommodate the total number of runs.

4.3 *Measurement of stack conditions.* 4.3.1 Measure the stack gas pressure, moisture, and temperature, using the equipment described in § 2.2. Determine the molecular weight of the stack gas. Sound engineering estimates may be made in lieu of direct measurements. The basis for such estimates shall be given in the test report.

4.4 *Preparation of sampling train.*—4.4.1 Assemble the sampling train as shown in figure 103-1. It is recommended that all glassware be precleaned by soaking in wash acid for 2 hours.

4.4.2 Leak check the sampling train at the sampling site. The leakage rate should not be in excess of 1 percent of the desired sample rate.

4.5 *Beryllium train operation.*—4.5.1 For each run, measure the velocity at the selected sampling point. Determine the isokinetic sampling rate. Record the velocity head and the required sampling rate.

4.5.2 Place the nozzle at the sampling point with the tip pointing directly into the

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gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. At the conclusion of the test, record the sampling rate. Again measure the velocity head at the sampling point. The required isokinetic rate at the end of the period should not have deviated more than 20 percent from that originally calculated.

4.5.3 Sample at a minimum rate of 0.5 ft^3/min. Samples shall be taken over such a period or periods as are necessary to determine the maximum emissions which would occur in a 24-hour period. In the csse of cyclic operations, sufficient tests shall be made so as to allow determination or calculation of the emissions which would occur over the duration of the cycle. A minimum sampling time of 2 hours is recommended.

4.5.4 All pertinent data should be included in the test report.

4.6 *Sample recovery.*—4.6.1 It is recommended that all glassware be precleaned as in § 4.4.1. Sample recovery should also be performed in an area free of possible beryllium contamination. When the sampling train is moved, exercise care to prevent breakage and contamination. Set aside a portion of the acetone used in the sample recovery as a blank for analysis. The total amount of acetone used should be measured for accurate blank correction. Blanks can be eliminated if prior analysis shows negligible amounts.

4.6.2 Remove the filter and any loose particulate matter from filter holder and place in a container.

4.6.3 Clean the probe with acetone and a brush or long rod and cotton balls. Wash into the container. Wash out the filter holder with acetone and add to the same container.

4.7 *Analysis.*—4.7.1 Make the necessary preparation of samples and analyze for beryllium. Any currently acceptable method such as atomic absorption, spectrographic, fluorometric, chromatographic, or equivalent may be used.

5. *Calibration and standards*—5.1 *Sampling train.*—5.1.1 As a procedural check, sampling rate regulation should be compared with a dry gas meter, spirometer, rotameter (calibrated for prevailing atmospheric conditions), or equivalent, attached to nozzle inlet of the complete sampling train.

5.1.2 Data from this test and calculations should be shown in test report.

5.2 *Analysis.*—5.2.1 Standardization is made as suggested by the manufacturer of the instrument or the procedures for the analytical method.

6. *Calculations*—6.1 *Total beryllium emission.* Calculate the total amount of beryllium emitted from each stack per day by equation 103-2. This equation is applicable for continuous operations. For cyclic operations, use only the time per day each stack is in operation. The total beryllium emissions from a source will be the summation of results from all stacks.

$$R = W_t(v_s)_{avg} A_s / V_{total} \times 86{,}400 \text{ seconds/day}/10^6 \ \mu g/g$$

where:

R = Rate of emission, g/day.
W_t = Total weight of beryllium collected, μg.
V_{total} = Total volume of gas sampled, ft^3.
$(v_s)_{avg.}$ = Average stack gas velocity, feet per second.
A_s = Stack area, ft^2.

7. *Test report.* 7.1 A test report shall be prepared which shall include as a minimum:

7.1.1 A detailed description of the sampling train used and results of the procedural check with all data and calculations made.

7.1.2 All pertinent data taken during test, the basis for any estimates made, calculations, and results.

7.1.3 A description of the test site, including a block diagram with a brief description of the process, location of the sample points in the cross section, dimensions and distances from any point of disturbance.

METHOD 104—REFERENCE METHOD FOR DETERMINATION OF BERYLLIUM EMISSIONS FROM STATIONARY SOURCES

1. *Principle and applicability*—1.1 *Principle.*—Beryllium emissions are isokinetically sampled from the source, and the collected sample is digested in an acid solution and analyzed by atomic absorption spectrophotometry.

1.2 *Applicability.*—This method is applicable for the determination of beryllium emissions in ducts or stacks at stationary sources. Unless otherwise specified, this method is not intended to apply to gas streams other than those emitted directly to the atmosphere without further processing.

2. *Apparatus*—2.1 *Sampling train.*—A schematic of the sampling train used by EPA is shown in figure 104-1. Commercial models of this train are available, although construction details are described in APTD-0581,[1] and operating and maintenance procedures are described in APTD-0576. The components essential to this sampling train are the following:

2.1.1 *Nozzle.*—Stainless steel or glass with sharp, tapered leading edge.

[1] These documents are available for a nominal cost from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Va. 22151.

2.1.2 *Probe.*—Sheathed Pyrex[2] glass. A heating system capable of maintaining a minimum gas temperature in the range of the stack temperature at the probe outlet during sampling may be used to prevent condensation from occurring.

2.1.3 *Pitot tube.*—Type S (figure 104-2), or equivalent, with a coefficient within 5 percent over the working range, attached to probe to monitor stack gas velocity.

2.1.4 *Filter holder.*—Pyrex glass. The filter holder must provide a positive seal against leakage from outside or around the filter. A heating system capable of maintaining the filter at a minimum temperature in the range of the stack temperature may be used to prevent condensation from occurring.

2.1.5 *Impingers.*—Four Greenburg-Smith impingers connected in series with glass ball joint fittings. The first, third, and fourth impingers may be modified by replacing the tip with a ½-inch i.d. glass tube extending to one-half inch from the bottom of the flask.

2.1.6 *Metering system.*—Vacuum gauge, leakless pump, thermometers capable of measuring temperature to within 5° F, dry gas meter with 2 percent accuracy, and related equipment, described in APTD-0581, to maintain an isokinetic sampling rate and to determine sample volume.

[2]Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

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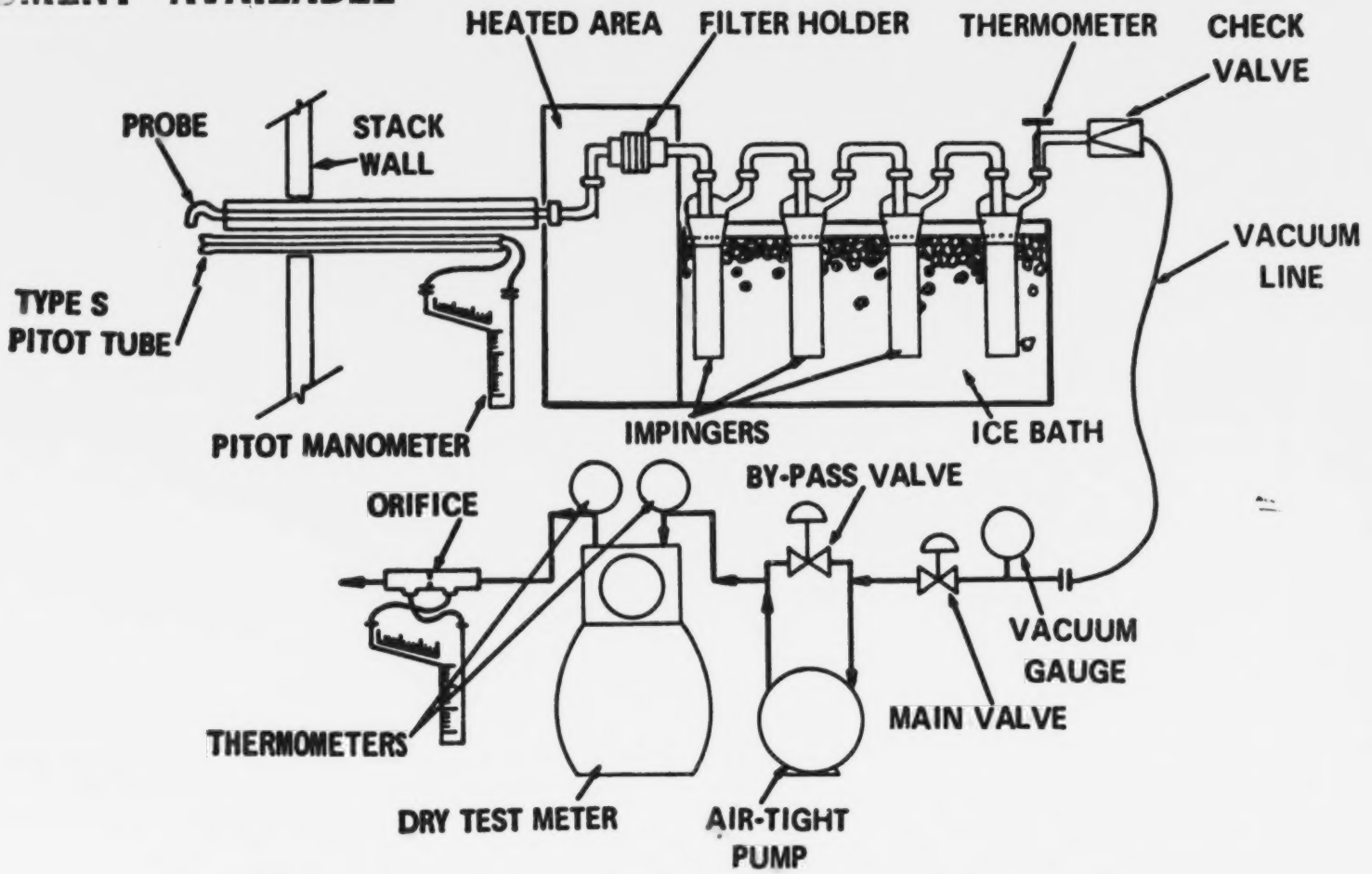

Figure 104-1. Beryllium sampling train

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2.1.7 *Barometer.*—To measure atmospheric pressure to ±0.1 in Hg.

2.2 *Measurement of stack conditions* (stack pressure, temperature, moisture and velocity).—2.2.1 *Pitot tube.*—Type S, or equivalent, with a coefficient within 5 percent over the working range.

2.2.2 *Differential pressure gauge.*—Inclined manometer, or equivalent, to measure velocity head to within 10 percent of the minimum value.

2.2.3 *Temperature gauge.*—Any temperature measuring device to measure stack temperature to within 3 °F.

2.2.4 *Pressure gauge.*—Pitot tube and inclined manometer, or equivalent, to measure stack pressure to within 0.1 in Hg.

2.2.5 *Moisture determination.*—Wet and dry bulb thermometers, drying tubes, condensers, or equivalent, to determine stack gas moisture content to within 1 percent.

2.3 *Sample recovery.*—2.3.1 *Probe cleaning rod.*—At least as long as probe.

2.3.2 *Leakless glass sample bottles.*—300 ml.

2.3.3 *Graduated cylinder.*—250 ml.

2.3.4 *Plastic jar.*—Approximately 300 ml.

2.4 *Analysis.*—2.4.1 *Atomic absorption spectrophotometer.*—To measure absorbance at 234.8 nm, Perkin Elmer Model 303, or equivalent, with N_2O/acetylene burner.

2.4.2 *Hot plate.*

2.4.3 *Perchloric acid fume hood.*

2.4.4 *Perchloric acid fume hood.*

3. *Reagents.*—3.1 *Stock reagents.*—3.1.1 *Nitric-perchloric acid.*—Concentrated.

3.1.2 *Perchloric acid.*—Concentrated, 70 percent.

3.1.3 *Nitric acid.*—Concentrated.

3.1.4 *Sulfuric acid.*—Concentrated.

3.1.5 *Distilled and deionized water.*

3.1.6 *Beryllium powder.*—98 percent minimum purity.

3.2 *Sampling.*—3.2.1 *Filter.*—Millipore AA, or equivalent. It is suggested that a Whatman 41 filter be placed immediately against the back side of the Millipore filter as a guard against breaking the Millipore filter. In the analysis of the filter, the Whatman 41 filter should be included with the Millipore filter.

3.2.2 *Silica gel.*—Indicating type, 6 to 16 mesh, dried at 350 °F for 2 hours.

3.2.3 *Distilled and deionized water.*

3.3 *Sample recovery.*—3.3.1 *Distilled and deionized water.*

3.3.2 *Acetone.*—Reagent grade.

3.3.3 *Wash acid.*—1:1 V/V hydrochloric acid-water.

3.4 *Analysis.*—3.4.1 *Sulfuric acid solution, 12 N.*—Dilute 333 ml of concentrated sulfuric acid 1 to 1 with distilled water.

3.4.2 *25 percent V/V hydrochloric acid-water.*

3.5 *Standard beryllium solution.*—3.5.1 *Stock solution.*—1 μg/ml beryllium. Dissolve 10 mg of beryllium in 80 ml of 12 N sulfuric acid solution and dilute to a volume of 1000 ml with distilled water. Dilute a 10 ml aliquot to 100 ml with 25 percent V/V hydrochloric acid, giving a concentration of 1 μg/ml. This dilute stock solution should be prepared fresh daily. Equivalent strength (in beryllium) stock solutions may be prepared from beryllium salts as $BeCl_2$ and $Be(NO_3)_2$ (98 percent minimum purity).

4. *Procedure.*—4.1 *Guidelines for source testing.* are detailed in the following sections. These guidelines are generally applicable; however, since sampling sites differ to some degree and temporary alterations such as stack extensions or expansions often are required to insure the best possible sample site. Further, since beryllium is hazardous, care should be taken to minimize exposure. Finally, since the total quantity of beryllium to be collected is quite small, the test must be carefully conducted to prevent contamination or loss of sample.

4.2 Selection of a sampling site and minimum number of traverse points.

4.2.1 Select a suitable sampling site that is as close as practicable to the point of atmospheric emission. If possible, stacks smaller than 1 foot in diameter should not be sampled.

4.2.2 The sampling site should be at least 8 stack or duct diameters downstream and 2 diameters upstream from any flow disturbance such as a bend, expansion or contraction. For a rectangular cross-section, determine an equivalent diameter from the following equation:

$$D_e = 2LW/L+W$$

eq. 104-1

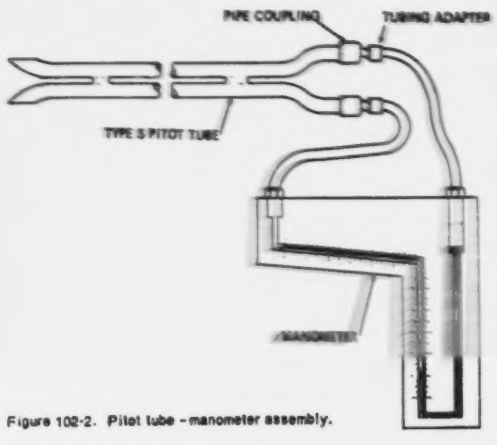

Figure 102-2. Pitot tube - manometer assembly.

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where:

D_e = equivalent diameter

L = length

W = width

4.2.3 When the above sampling site criteria can be met, the minimum number of traverse points is four (4) for stacks 1 foot in diameter or less, eight (8) for stacks larger than 1 foot but 2 feet in diameter or less, and twelve (12) for stacks larger than 2 feet.

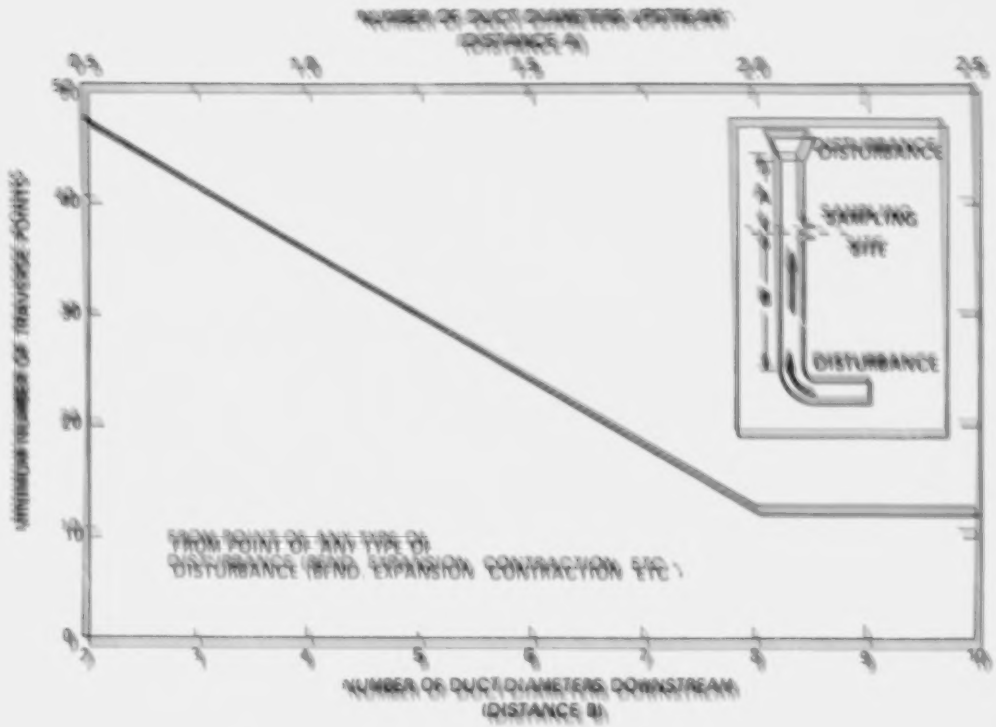

Figure 1(1)-3. Minimum number of traverse points.

Figure 104-1. Cross section of circular stack showing location of traverse points in relation to measurement ports.

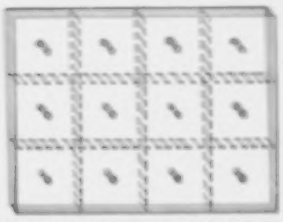

Figure 104-2. Cross section of rectangular stack divided into 12 equal areas, with traverse points at centroid of each area.

4.2.4 Some sampling situations may render the above sampling site criteria impractical. When this is the case, choose a convenient sampling location and use figure 104-3 to determine the minimum number of traverse points. However, use figure 104-3 only for stacks 2 feet in diameter or larger.

4.2.5 To use figure 104-3, first measure the distance from the chosen sampling location to the nearest upstream and downstream disturbances. Divide this distance by the diameter or equivalent diameter to determine the distance in terms of pipe diameters. Determine the corresponding number of traverse points for each distance from figure 104-3. Select the higher of the two numbers of traverse points, or a greater value, such that for circular stacks the number is a multiple of four, and for rectangular stacks the number follows the criteria of section 4.3.2.

4.2.6 If a selected sampling point is closer than 1 inch from the stack wall, adjust the location of that point to ensure that the sample is taken at least 1 inch away from the wall.

4.3 Cross-sectional layout and location of traverse points.

TABLE 104-1—LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.3	2.5	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.7	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.5	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.5	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.3	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.8	10.5
6			95.6	80.6	65.8	35.5	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.5	36.6	28.3	23.6	20.4	18.0	16.1
8				96.7	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.9	82.3	73.1	62.5	38.2	30.6	26.1	23.0
10					97.5	88.2	78.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.9	67.0
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

4.3.1 For circular stacks locate the traverse points on at least two diameters according to figure 104-4 and table 104-1. The traverse axes shall divide the stack cross section into equal parts.

4.3.2 For rectangular stacks divide the cross section into as many equal rectangular areas as traverse points, such that the ratio of the length to the width of the elemental areas is between 1 and 2. Locate the traverse points at the centroid of each equal area according to figure 104-5.

4.4 *Measurement of stack conditions.*

4.4.1 Set up the apparatus as shown in

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re all connections are tight and leak free. Measure the velocity head and temperature at the traverse points specified by paragraphs 4.2 and 4.3.

4.4.2 Measure the static pressure in the stack.

4.4.3 Determine the stack gas moisture.

4.4.4 Determine the stack gas molecular weight from the measured moisture content and knowledge of the expected gas stream composition. A standard Orsat analyzer has been found valuable at combustion sources. In all cases, sound engineering judgment should be used.

4.5 Preparation of *sampling train.*—4.5.1 Prior to assembly, clean all glassware (probe, impingers, and connectors) by soaking in each acid for 2 hours. Place 100 ml of distilled water in each of the first two impingers, leave the third impinger empty, and place approximately 200 g of preweighted silica gel in the fourth impinger. Save a portion of the distilled water as a blank in the sample analysis. Set up the train and the probe as in figure 104-1.

4.5.2 Leak check the sampling train at the sampling site. The leakage rate should not be in excess of 1 percent of the desired sampling rate. If condensation in the probe or filter is a problem, probe and filter heaters will be required. Adjust the heaters to provide a temperature at or above the stack temperature. However, membrane filters such as the Millipore AA are limited to about 225° F. If the stack gas is in excess of about 200° F., consideration should be given to an alternate procedure such as moving the filter holder downstream of the first impinger to insure that the filter does not exceed its temperature limit. Place crushed ice around the impingers. Add more ice during the test to keep the temperature of the gases leaving the last impinger at 70° F. or less.

4.6 *Beryllium train operation.*—4.6.1 For each run, record the data required on the example sheet shown in figure 104-6. Take readings at each sampling point at least every 5 minutes and when significant changes in stack conditions necessitate additional adjustments in flow rate.

4.6.2 Sample at a rate of 0.5 to 1.0 ft.^{3}/min. Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which would occur in a 24-hour period. In the case of cyclic operations, sufficient tests shall be made so as to allow accurate determination or calculation of the emissions which will occur over the duration of the cycle. A minimum sample time of 2 hours is recommended.

PLANT _____
LOCATION _____
OPERATOR _____
DATE _____
RUN NO. _____
SAMPLE BOX NO. _____
METER BOX NO. _____
METER $\Delta H_@$ _____
C FACTOR _____

SCHEMATIC OF STACK CROSS SECTION

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
HEATER BOX SETTING _____
PROBE LENGTH, m. _____
NOZZLE DIAMETER, in. _____
PROBE HEATER SETTING _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (P_s), in. Hg.	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s),	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O	GAS SAMPLE VOLUME (Vm), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER		SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
							INLET (Tm_{in}), °F	OUTLET (Tm_{out}), °F		
TOTAL							Avg.	Avg.		
AVERAGE							Avg.			

Figure 104-6. : Field data

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4.6.3 To begin sampling, position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Sample for at least 5 minutes at each traverse point; sampling time must be the same for each point. Maintain isokinetic sampling throughout the sampling period. Nomographs which aid in the rapid adjustment of the sampling rate without other computations are in APTD-0576 and are available from commercial suppliers. Note that standard monographs are applicable only for type S pitot tubes and air or a stack gas with an equivalent density. Contact EPA or the sampling train supplier for instructions when the standard monograph is not applicable.

4.6.4 Turn off the pump at the conclusion of each run and record the final readings. Immediately remove the probe and nozzle from the stack and handle in accordance with the sample recovery process described in § 4.7.

4.7 *Sample recovery.*—4.7.1 (All glass storage bottles and the graduated cylinder must be precleaned as in § 4.5.1.) This operation should be performed in an area free of possible beryllium contamination. When the sampling train is moved, care must be exercised to prevent breakage and contamination.

4.7.2 Disconnect the probe from the impinger train. Remove the filter and any loose particulate matter from the filter holder and place in a sample bottle. Place the contents (measured to ±1 ml) of the first three impingers into another sample bottle. Rinse the probe and all glassware between it and the back half of the third impinger with water and acetone, and add this to the later sample bottle. Clean the probe with a brush or a long slender rod and cotton balls. Use acetone while cleaning. Add these to the sample bottle. Retain a sample of the water and acetone as a blank. The total amount of wash water and acetone used should be measured for accurate blank correction. Place the silica gel in the plastic jar. Seal and secure all sample containers for shipment. If an additional test is desired, the glassware can be carefully double rinsed with distilled water and reassembled. However, if the glassware is to be out of use more than 2 days, the initial acid wash procedure must be followed.

4.8 Analysis.

4.8.1 *Apparatus preparation.*—Clean all glassware according to the procedure of section 4.5.1. Adjust the instrument settings according to the instrument manual, using an absorption wavelength of 234.8 nm.

4.8.2 *Sample preparation.*—The digestion of beryllium samples is accomplished in part in concentrated perchloric acid. *Caution:* The analyst must insure that the sample is heated to light brown fumes after the initial nitric acid addition; otherwise, dangerous perchlorates may result from the subsequent perchloric acid digestion. Perchloric acid also should be used only under a perchloric acid hood.

4.8.2.1 Transfer the filter and any loose particulate matter from the sample container to a 150 ml beaker. Add 35 ml concentrated nitric acid. Heat on a hotplate until light brown fumes are evident to destroy all organic matter. Cool to room temperature and add 5 ml concentrated sulfuric acid and 5 ml concentrated perchloric acid. Then proceed with step 4.8.2.4.

4.8.2.2 Place a portion of the water and acetone sample into a 150 ml beaker and put on a hotplate. Add portions of the remainder as evaporation proceeds and evaporate to dryness. Cool the residue and add 35 ml concentrated nitric acid. Heat on a hotplate until light brown fumes are evident to destroy any organic matter. Cool to room temperature and add 5 ml concentrated sulfuric acid, and 5 ml concentrated perchloric acid. Then proceed with step 4.8.2.4.

4.8.2.3 Weigh the spent silica gel and report to the nearest gram.

4.8.2.4 Samples from 4.8.2.1 and 4.8.2.2 may be combined here for ease of analysis. Replace on a hotplate and evaporate to dryness in a perchloric acid hood. Cool and dissolve the residue in 10.0 ml of 25 percent V/V hydrochloric acid. Samples are now ready for the atomic absorption unit. The beryllium concentration of the sample must be within the calibration range of the unit. If necessary, further dilution of sample with 25 percent V/V hydrochloric acid must be performed to bring the sample within the calibration range.

4.8.3 *Beryllium determination.*—Analyze the samples prepared in 4.8.2 at 234.8 nm using a nitrous oxide/acetylene flame. Aluminum, silicon and other elements can interfere with this method if present in large quantities. Standard methods are available, however, to effectively eliminate these interferences (see Reference 5).

5. *Calibration*—5.1 *Sampling train.*—5.1.1 Use standard methods and equipment as detailed in APTD-0576 to calibrate the rate meter, pitot tube, dry gas meter and probe heater (if used). Recalibrate prior to each test series.

5.2 *Analysis.*—5.2.1 Standardization is made with the procedure as suggested by the manufacturer with standard beryllium solution. Standard solutions will be prepared from the stock solution by dilution with 25 percent V/V hydrochloric acid. The linearity of working range should be established with a series of standard solutions. If collected samples are out of the linear range, the samples should be diluted. Standards should be interspersed with the sam-

ples since the calibration can change slightly with time.

6. *Calculations*—6.1 *Average dry gas meter temperature, stack temperature, stack pressure and average orifice pressure drop.*—See data sheet (figure 104-6).

6.2 *Dry gas volume.*—Correct the sample volume measured by the dry gas meter to stack conditions by using equation 104-2.

$$V_{ms} = V_m \frac{T_s}{T_m} \frac{\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{P_s}$$

eq. 104-2

where:

V_{ms} = Volume of gas sample through the dry gas meter (stack conditions), ft³.

V_m = Volume of gas sample through the dry gas meter (meter conditions), ft³.

T_s = Average temperature of stack gas, °R.

T_m = Average dry gas meter temperature, °R.

P_{bar} = Barometric pressure at the orifice meter, in Hg.

ΔH = Average pressure drop across the orifice meter, in H_2O.

13.6 = Specific gravity of mercury.

P_s = Stack pressure, $P_{bar} \pm$ static pressure, in Hg.

6.3 *Volume of water vapor.*

$$W_{ws} = K_w V_{lc} \frac{T_s}{P_s}$$

eq. 104-3

where:

V_{ws} = Volume of water vapor in the gas sample (stack conditions), ft³.

K_w = 0.00267 in Hg-ft³/ml°R, when these units are used.

V_{lc} = Total volume of liquid collected in impingers and silica gel (see figure 104-7), ml.

T_s = Average stack gas temperature, °R.

P_s = Stack pressure, $P_{bar} \pm$ static pressure, in Hg.

6.4 *Total gas volume.*

$$V_{total} = V_{ms} + V_{ws}$$

eq. 104-4

where:

V_{total} = Total volume of gas sample (stack conditions), ft³.

V_{ms} = Volume of gas through dry gas meter (stack conditions) ft³.

V_{ws} = Volume of water vapor in gas sample (stack conditions), ft³.

6.5 *Stack gas velocity.*

Use equation 104-5 to calculate the stack gas velocity.

$$(v_s)_{avg.} = K_p C_p (\sqrt{\Delta p})_{avg.} \sqrt{\frac{(T_s)_{avg.}}{P_s M_s}}$$

eq. 104-5

where:

$(v_s)_{avg.}$ = Average stack gas velocity, feet per second.

K_p = 85.53 ft. sec (lb-inHg/lb mole-°R-inH_2O)½ when these units are used.

C_p = Pitot tube coefficient, dimensionless.

$(T_s)_{avg.}$ = Average stack gas temperature, °R.

$(\sqrt{\Delta p})_{avg.}$ = Average square root of the velocity head of stack gas (in H_2O)½ (see figure 104-8).

P_s = Stack pressure, $P_{bar} \pm$ static pressure, in Hg.

M_s = Molecular weight of stack gas (wet basis) the summation of the products of the molecular weight of each component multiplied by its volumetric proportion in the mixture, lb/lb-mole.

Figure 104-8 shows a sample recording sheet for velocity traverse data. Use the averages in the last two columns of figure 104-8 to determine the average stack gas velocity from equation 104-5.

6.6 *Beryllium collected.*—Calculate the total weight of beryllium collected by using equation 104-6.

$$W_t = V_t C_t - V_w C_w - V_s C_s$$

eq. 104-6

where:

W_t = Total weight of beryllium collected, μg.

V_t = Total volume of hydrochloric acid from step 4.8.2.4, ml.

	VOLUME OF LIQUID WATER COLLECTED	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
LIQUID COLLECTED		
TOTAL VOLUME COLLECTED		g* ml

*CONVERT WEIGHT OF WATER TO VOLUME BY dividing total weight INCREASE BY DENSITY OF WATER. (1 g/ml):

$$\frac{\text{INCREASE, g}}{(1\ \text{g/ml})} = \text{VOLUME WATER, ml}$$

Figure 104-7. Analytical data.

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C_l = Concentration of beryllium found in sample, μg/ml.
V_w = Total volume of water used in sampling (impinger contents plus all wash amounts), ml.
C_w = Blank concentration of beryllium in water, μg/ml.
V_a = Total volume of acetone used in sampling (impinger contents plus all).
C_a = Blank concentration of beryllium in acetone, μg/ml.

6.7 *Total beryllium emissions.*—Calculate the total amount of beryllium emitted from each stack per day by equation 104-7. This equation is applicable for continuous operations. For cyclic operations, use only the time per day each stack is in operation. The total beryllium emissions from a source will be the summation of results from all stacks.

$$R = W_t(v_s)_{avg} A_s / V_{total} \times 86{,}400 \text{ seconds/day} / 10^6 \text{ μg/g}$$

eq. 104-7

where:

R = Rate of emission, g/day.
W_t = Total weight of beryllium collected, μg.
V_{total} = Total volume of gas sample (stack conditions), ft^3.
$(v_s)_{avg}$ = Average stack gas velocity, feet per second. A_s = Stack area, ft^2.

6.8 *Isokinetic variation (comparison of velocity of gas in probe tip to stack velocity).*

$$I = 100 V_{total} / A_n \theta / (vs)_{avg}$$

eq. 104-8

where:

I = Percent of isokinetic sampling.
V_{total} = Total volume of gas sample (stack conditions) ft^3.
A_n = Probe tip area, ft^2.
θ = Sampling time, sec.
$(v_s)_{avg}$ = Average stack gas velocity, feet per second.

7. *Evaluation of results*—7.1 *Determination of compliance.*—7.1.1 Each performance test shall consist of three repetitions of the applicable test method. For the purpose of determining compliance with an applicable national emission standard, the average of results of all repetitions shall apply.

7.2 *Acceptable isokinetic results.*—7.2.1 The following range sets the limit on acceptable isokinetic sampling results:

If 90 percent I 110 percent, the results are acceptable; otherwise, reject the test and repeat.

8. *References.*—1. Addendum to Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, December 6, 1967.

2. Amos, M. D., and Willis, J. B., "Use of High-Temperature Pre-Mixed Flames in Atomic Absorption Spectroscopy," Spectrochim. Acta, 22: 1325, 1966.

3. Determining Dust Concentration in a Gas Stream, ASME Performance Test Code No. 27, New York, N.Y., 1957.

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PLANT_____

DATE_____

RUN NO._____

STACK DIAMETER, in._____

BAROMETRIC PRESSURE, in. Hg._____

STATIC PRESSURE IN STACK (P_g), in. Hg._____

OPERATORS_____

SCHEMATIC OF STACK CROSS SECTION

Traverse point number	Velocity head, in. H_2O	$\sqrt{\Delta_P}$	Stack Temperature (T_S), °F
	AVERAGE:		

Figure 104-8. Velocity traverse data.

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8. Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases, Western Precipitation Division of Joy Manufacturing Co., Los Angeles, Calif. Bulletin WP-50, 1968.

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13. Smith, W. S. et al., Stack Gas Sampling Improved and Simplified with New Equipment, APCA Paper No. 67-119, 1967.

14. Smith, W. S., R. T. Shigehara, and W. F. Todd, A Method of Interpreting Stack Sampling Data, Paper presented at the 63d annual meeting of the Air Pollution Control Association, St. Louis, Mo., June 14-19, 1970.

15. Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, 1967.

16. Standard Method for Sampling Stacks for Particulate Matter, In: 1971 Book of ASTM standards, Part 23, Philadelphia, 1971, ASTM Designation D-2928-71.

17. Vennard, J. K., Elementary Fluid Mechanics, John Wiley and Sons, Inc., New York, 1947.

METHOD 105—METHOD FOR DETERMINATION OF MERCURY IN WASTEWATER TREATMENT PLANT SEWAGE SLUDGES

1. *Principle and applicability.* 1.1 Principle—A weighed portion of the sewage sludge sample is digested in aqua regia for 2 minutes at 95° C, followed by oxidation with potassium permanganate. Mercury in the digested sample is then measured by the conventional spectrophotometer cold vapor technique. An alternative digestion involving the use of an autoclave is described in paragraph 4.5.2 of this method.

1.2 Applicability—This method is applicable for the determination of total organic and inorganic mercury content in sewage sludges, soils, sediments, and bottom-type materials. The normal range of this method is 0.2 to 5 μg/g. The range may be extended above or below the normal range by increasing or decreasing sample size and through instrument and recorder control.

2. *Apparatus.* 2.1 Analysis—The conventional cold vapor technique (5) is used to analyze the sample.

2.1.1 Atomic Absorption Spectrophotometer [1]—Any atomic absorption unit having an open sample presentation area in which to mount the absorption cell is suitable. Instrument settings recommended by the particular manufacturer should be followed.

2.1.2 Mercury Hollow Cathode Lamp—Westinghouse WL-22847, argon filled, or equivalent.

2.1.3 Recorder—Any multirange, variable-speed recorder that is compatible with the UV detection system is suitable.

2.1.4 Absorption Cell—Standard spectrophotometer cells 10 cm long, having quartz end windows may be used. Suitable cells may be constructed from plexiglass tubing. 2.5 cm O.D. x 11.4 cm (ca. 1" O.D. x 4½"). The ends are ground perpendicular to the longitudinal axis, and quartz windows [2.5 cm diameter x 0.16 cm thickness (ca. 1" diameter x 1/16" thickness)] are cemented in place. Gas inlet and outlet ports [also of plexiglass but 0.6 cm O.D. (ca. ¼" O.D.)] are attached approximately 1.3 cm (½") from each end. The cell is strapped to a burner for support and aligned in the light beam to give the maximum transmittance. NOTE: Two 5.1 cm x 5.1 cm (ca. 2" x 2") cards with 2.5 cm (ca. 1") diameter holes may be placed over each end of the cell to assist in positioning the cell for maximum transmittance.

2.1.5 Air Pump—Any peristaltic pump capable of delivering 1 liter of air per minute may be used. A Masterflex pump with electronic speed control has been found to be satisfactory. (Regulated compressed air can be used in an open one-pass system.)

2.1.6 Flowmeter—Capable of measuring an air flow of 1 liter per minute.

2.1.7 Aeration Tubing—Tygon tubing is used for passage of the mercury vapor from the sample bottle to the absorption cell and return. Straight glass tubing terminating in a coarse porous frit is used for sparging air into the sample.

2.1.8 Drying Tube—15 cm long x 1.9 cm diameter (ca. 6" long x ¾" diameter) tube containing 20 grams of the desiccant magnesium perchlorate. The apparatus is assembled as shown in Figure 105-1. In place of

[1] Instruments designed specifically for the measurement of mercury using the cold vapor technique are commercially available and may be substituted for the atomic absorption spectrophotometer.

the magnesium perchlorate drying tube, a small reading lamp with 60W bulb may be used to prevent condensation of moisture inside the cell. The lamp is positioned so as not to interfere with the measurement and to shine on the absorption cell maintaining the air temperature about 5° C. above ambient.

3. *Reagents.*

3.1 Analysis.

3.1.1 Aqua Regia—Prepare immediately before use by carefully adding three volumes of concentrated HCl to one volume of concentrated HNO_3.

3.1.2 Sulfuric Acid, 0.5N—Dilute 14.0 ml of concentrated sulfuric acid to 1.0 liter.

3.1.3 Stannous Sulfate—Add 25 g stannous sulfate to 250 ml of 0.5N sulfuric acid. This mixture is a suspension and should be stirred continuously during use. Stannous chloride may be used in place of the stannous sulfate.

3.1.4 Sodium Chloride—Hydroxylamine Sulfate Solution—Dissolve 12 grams of sodium chloride and 12 grams of hydroxylamine sulfate in distilled water and dilute to 100 ml. Hydroxylamine hydrochloride may be used in place of the hydroxylamine sulfate.

3.1.5 Potassium Permanganate—5% solution, w/v. Dissolve 5 grams of potassium permanganate in 100 ml of distilled water.

3.1.6 Stock Mercury Solution—Dissolve 0.1354 grams of reagent grade mercuric chloride (Assay >95%) in 75 ml of distilled water. Add 10 ml of concentrated nitric acid and adjust the volume to 100.0 ml. 1 ml=1 mg Hg.

3.1.7 Working Mercury Solution—Make successive dilutions of the stock mercury solution to obtain a working standard containing 0.1 μg per ml. This working standard and the dilutions of the stock mercury solution should be prepared fresh daily. Acidity of the working standard should be maintained at 0.15% nitric acid. This acid should be added to the flask as needed before the addition of the aliquot. Mercuric solutions should not be prepared in plastic containers.

4. *Procedures.* Samples for mercury analysis are subject to contamination from a variety of sources. Extreme care must be taken to prevent contamination. Certain interferences may occur during the analysis procedures. Extreme caution must be taken to avoid inhalation of mercury.

4.1 Sample Handling and Preservation.

4.1.1 Because of the extreme sensitivity of the analytical procedure and the omnipresence of mercury, care must be taken to avoid extraneous contamination. Sampling devices, sample containers, and reagents should be ascertained to be free of significant amounts of mercury; the sample should not be exposed to any condition in the laboratory that may result in contact or airborne mercury contamination. Sample containers to be used for collection and shipment of mercury samples should be properly cleaned before use. These should be rinsed with at least 20% v/v HNO_3 followed by distilled water.

4.1.2 While the sample may be analyzed without drying, it has been found to be more convenient to analyze a dry sample. Moisture may be driven off in a drying oven at a temperature of 60°C. No significant mercury losses have been observed by using this drying step. The dry sample should be pulverized and thoroughly mixed before the aliquot is weighed.

4.2 Interferences.

4.2.1 Interferences that may occur in sludge samples are sulfides, high copper, high chlorides, etc. A discussion of possible interferences and suggested preventative measures to be taken is given in Reference (6)(7).

4.2.2 Volatile materials which absorb at the 253.7 nm will cause a positive interference. In order to remove any interfering volatile materials, the dead air space in the BOD bottle should be purged with nitrogen before the addition of stannous sulfate.

4.3 Handling Sample Mercury Vapors After Analysis.

4.3.1 Because of the toxic nature of mercury vapor, precaution must be taken to avoid its inhalation. Therefore, a bypass should be included in the analysis system to either vent the mercury vapor into an exhaust hood or pass the vapor through some absorbing media, such as:

(a) equal volumes of 0.1N $KMnO_4$ and 10% H_2SO_4;

(b) 0.25% iodine in a 3% KI solution.

A specially treated charcoal that will absorb mercury vapor is also available from Barnebey and Cheney, E. 8th Ave. and North Cassidy St., Columbus, Ohio 43219, Catalog No. 580-13 or No. 580-22.[2]

4.4 Calibration.

4.4.1 Transfer 0, 0.5, 1.0, 2.0, 5.0 and 10 ml aliquots of the working mercury solution containing 0 to 1.0 μg of mercury to a series of 300-ml BOD bottles. Add enough distilled water to each bottle to make a total volume of 10 ml. Add 5 ml of aqua regia and heat 2 minutes in a water bath at 95°C. Allow the sample to cool and add 50 ml distilled water and 15 ml of $KMnO_4$ solution to each bottle and return to the water bath for 30 minutes. Cool and add 6 ml of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Add 50 ml of distilled water. Treating each bottle individually, add 5 ml of stannous sulfate solution and immediately attach the bottle to the aeration ap-

[2]Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

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paratus. At this point, the sample is allowed to stand quietly without manual agitation. The circulating pump, which has previously been adjusted to a rate of 1 liter per minute, is allowed to run continuously. The absorbance, as exhibited either on the spectrophotometer or the recorder, will increase and reach maximum within 30 seconds. As soon as the recorder pen levels off, approximately 1 minute, open the bypass valve and continue the aeration until the absorbance returns to its minimum value. Close the bypass valve, remove the fritted tubing from the BOD bottle and continue the aeration. Proceed with the standards and construct a standard curve by plotting peak height versus micrograms of mercury.

4.5 Analysis.

4.5.1 Weigh triplicate 0.2g±0.001 g portions of dry sample and place in bottom of a BOD bottle. Add 5 ml of distilled water and 5 ml of aqua regia. Heat 2 minutes in a water bath at 95°C. Cool and add 50 ml distilled water and 15 ml potassium permanganate solution to each sample bottle. Mix thoroughly and place in the water bath for 30 minutes at 95°C. Cool and add 6 ml of sodium chloride-hydroxylamine sulfate to reduce the excess permanganate. Add 55 ml of distilled water. Treating each bottle individually, add 5 ml of stannous sulfate and immediately attach the bottle to the aeration apparatus. With each sample, continue as described in paragraph 4.4.1 of this method.

4.5.2 An alternative digestion procedure using an autoclave may also be used. In this method 5 ml of concentrated H_2SO_4 and 2 ml of concentrated HNO_3 are added to the 0.2 grams of sample. 5 ml of saturated $KMnO_4$ solution are added and the bottle is covered with a piece of aluminum foil. The samples are autoclaved at 121°C and 2.1 kg/cm^2 (ca. 15 psig) for 15 minutes. Cool, make up to a volume of 100 ml with distilled water, and add 6 ml of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Purge the dead air space and continue as described in paragraph 4.4.1 of this method.

5. *Calculation.* 5.1 Measure the peak height of the unknown from the chart and read the mercury value from the standard curve.

5.2 Calculate the mercury concentration in the sample by the formula:

$\mu g\ Hg/gm = \mu g$ Hg in the aliquot/wt. of the aliquot in g

5.3 Report mercury concentrations as follows: Below 0.1 μg/g; between 0.1 and 1 μg/g, to the nearest 0.01 μg/g; between 1 and 10 μg/g, to nearest 0.1 μg; above 10 μg/g, to nearest μg.

6. *Precision and accuracy.* 6.1 According to the provisional method in reference number 5, the following standard deviations on replicate sediment samples have been recorded at the indicated levels: 0.29 μg/g±0.02 and 0.82 μg/g±0.03. Recovery of mercury at these levels, added as methyl mercuric chloride, was 97 and 94%, respectively.

7. *References.*

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Method 106—Determination of Vinyl Chloride from Stationary Sources

Introduction

Performance of this method should not be attempted by persons unfamiliar with the operation of a gas chromatograph, nor by those who are unfamiliar with source sampling, as there are many details that are beyond the scope of this presentation. Care must be exercised to prevent exposure of sampling personnel to vinyl chloride, a carcinogen.

1. Principle and Applicability.

1.1 An integrated bag sample of stack gas containing vinyl chloride (chloroethene) is subjected to chromatographic analysis, using a flame ionization detector.

1.2 The method is applicable to the measurement of vinyl chloride in stack gases from ethylene dichloride, vinyl chloride and polyvinyl chloride manufacturing processes, except where the vinyl chloride is contained in particulate matter.

2. Range and Sensitivity.

The lower limit of detection will vary according to the chromatograph used. Values reported include 1×10^{-7} mg and 4×10^{-7} mg.

3. *Interferences.* Acetaldehyde, which can occur in some vinyl chloride sources, will in-

terfere with the vinyl chloride peak from the Chromasorb 102[1] column. See sections 4.3.2 and 6.4. If resolution of the vinyl chloride peak is still not satisfactory for a particular sample, then chromatograph parameters can be further altered with prior approval of the Administrator. If alteration of the chromatograph parameters fails to resolve the vinyl chloride peak, then supplemental confirmation of the vinyl chloride peak through an absolute analytical technique, such as mass spectroscopy, must be performed.

4. Apparatus.

4.1 *Sampling* (Figure 106-1).

4.1.1 Probe—Stainless steel, Pyrex glass, or Teflon tubing according to stack temperature, each equipped with a glass wool plug to remove particulate matter.

4.1.2 Sample line—Teflon, 6.4 mm outside diameter, of sufficient length to connect probe to bag. A new unused piece is employed for each series of bag samples that constitutes an emission test.

4.1.3 Male (2) and female (2) stainless steel quick-connects, with ball checks (one pair without) located as shown in Figure 106-1.

4.1.4 Tedlar bags, 100 liter capacity—To contain sample. Teflon bags are not acceptable. Aluminized Mylar bags may be used, provided that the samples are analyzed within 24 hours of collection.

4.1.5 Rigid leakproof containers for 4.1.4, with covering to protect contents from sunlight.

4.1.6 Needle valve—To adjust sample flow rate.

4.1.7 Pump—Leak-free. Minimum capacity 2 liters per minute.

4.1.8 Charcoal tube—To prevent admission of vinyl chloride to atmosphere in vicinity of samplers.

4.1.9 Flow meter—For observing sample flow rate; capable of measuring a flow range from 0.10 to 1.00 liter per minute.

4.1.10 *Connecting tubing.* Teflon, 6.4 mm outside diameter, to assemble sample train (Figure 106-1).

4.1.11 Pitot tube—Type S (or equivalent), attached to the probe so that the sampling flow rate can be regulated proportional to the stack gas velocity.

4.2 Sample recovery.

4.2.1 Tubing—Teflon, 6.4 mm outside diameter, to connect bag to gas chromatograph sample loop. A new unused piece is employed for each series of bag samples that constitutes an emission test, and is to be discarded upon conclusion of analysis of those bags.

4.3 Analysis.

4.3.1 Gas chromatograph—With flame ionization detector, potentiometric strip chart recorder and 1.0 to 5.0 ml heated sampling loop in automatic sample valve.

4.3.2 *Chromatographic column.* Stainless steel, 2 m×3.2 mm, containing 80/100 mesh Chromasorb 102. A secondary column of GE SF-96, 20 percent on 60/80 mesh AW Chromasorb P, stainless steel, 2 m×3.2 mm or Porapak T, 80/100 mesh, stainless steel, 1 m ×3.2 mm is required if acetaldehyde is present. If used, a secondary column is placed after the Chromasorb 102 column. The combined columns should then be operated at 120° C.

4.3.3 Flow meters (2)—Rotameter type, 0 to 100 ml/min capacity, with flow control valves.

4.3.4 Gas regulators—For required gas cylinders.

4.3.5 Thermometer—Accurate to one degree centigrade, to measure temperature of heated sample loop at time of sample injection.

4.3.6 Barometer—Accurate to 5 mm Hg, to measure atmospheric pressure around gas chromatograph during sample analysis.

4.3.7 Pump—Leak-free. Minimum capacity 100 ml/min.

4.4 Calibration.

4.4.1 Tubing—Teflon, 6.4 mm outside diameter, separate pieces marked for each calibration concentration.

4.4.2 Tedlar bags—Sixteen-inch square size, separate bag marked for each calibration concentration.

4.4.3 Syringe—0.5 ml, gas tight.

4.4.4 Syringe—50μl, gas tight.

4.4.5 Flow meter—Rotameter type, 0 to 1000 ml/min range accurate to ±1%, to meter nitrogen in preparation of standard gas mixtures.

4.4.6 Stop watch—Of known accuracy, to time gas flow in preparation of standard gas mixtures.

5. Reagents. It is necessary that all reagents be of chromatographic grade.

5.1 Analysis.

5.1.1 Helium gas or nitrogen gas—Zero grade, for chromatographic carrier gas.

5.1.2 Hydrogen gas—Zero grade.

5.1.3 Oxygen gas, or Air, as required by the detector—Zero grade.

5.2 *Calibration.* Use one of the following options: either 5.2.1 and 5.2.2, or 5.2.3.

5.2.1 *Vinyl chloride, 99.9+ percent.* Pure vinyl chloride gas certified by the manufacturer to contain a minimum of 99.9 percent vinyl chloride for use in the preparation of standard gas mixtures in Section 7.1. If the gas manufacturer maintains a bulk cylinder supply of 99.9+ percent vinyl chloride, the certification analysis may have been performed on this supply rather than on each gas cylinder prepared from this bulk supply. The date of gas cylinder preparation and

[1]Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

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the certified analysis must have been affixed to the cylinder before shipment from the gas manufacturer to the buyer.

5.2.2 *Nitrogen gas.* Zero grade, for preparation of standard gas mixtures.

5.2.3 *Cylinder standards (3).* Gas mixture standards (50, 10, and 5 ppm vinyl chloride in nitrogen cylinders) for which the gas composition has been certified by the manufacturer. The manufacturer must have recommended a maximum shelf life for each cylinder so that the concentration does not change greater than ±5 percent from the certified value. The date of gas cylinder preparation, certified vinyl chloride concentration and recommended maximum shelf life must have been affixed to the cylinder before shipment from the gas manufacturer to the buyer. These gas mixture standards may be directly used to prepare a chromatograph calibration curve as described in section 7.3.

5.2.3.1 *Cylinder standards certification.* The concentration of vinyl chloride in nitrogen in each cylinder must have been certified by the manufacturer by a direct analysis of each cylinder using an analytical procedure that the manufacturer had calibrated on the day of cylinder analysis. The calibration of the analytical procedure shall, as a minimum, have utilized a three-point calibration curve. It is recommended that the manufacturer maintain two calibration standards and use these standards in the following way: (1) A high concentration standard (between 50 and 100 ppm) for preparation of a calibration curve by an appropriate dilution technique; (2) a low concentration standard (between 5 and 10 ppm) for verification of the dilution technique used.

5.2.3.2 *Establishment and verification of calibration standards.* The concentration of each calibration standard must have been established by the manufacturer using reliable procedures. Additionally, each calibration standard must have been verified by the manufacturer by one of the following procedures, and the agreement between the initially determined concentration value and the verification concentration value must be within ±5 percent: (1) verification value determined by comparison with a calibrated vinyl chloride permeation tube, (2) verification value determined by comparison with a gas mixture prepared in accordance with the procedure described in section 7.1 and using 99.9+ percent vinyl chloride, or (3) verification value obtained by having the calibration standard analyzed by the National Bureau of Standards. All calibration standards must be renewed on a time interval consistent with the shelf life of the cylinder standards sold.

6. Procedure.

6.1 Sampling. Assemble the sample train as in Figure 106-1. Perform a bag leak check according to Section 7.4. Observe that all connections between the bag and the probe are tight. Place the end of the probe at the centroid of the stack and start the pump with the needle valve adjusted to yield a flow of 0.5 lpm. After a period of time sufficient to purge the line several times has elapsed, connect the vacuum line to the bag and evacuate the bag until the rotameter indicates no flow. Then reposition the sample and vacuum lines and begin the actual sampling, keeping the rate proportional to the stack velocity. Direct the gas exiting the rotameter away from sampling personnel. At the end of the sample period, shut off the pump, disconnect the sample line from the bag, and disconnect the vacuum line from the bag container. Protect the bag container from sunlight.

6.2 *Sample storage.* Sample bags must be kept out of direct sunlight. When at all possible analysis is to be performed within 24 hours, but in no case in excess of 72 hours of sample collection.

6.3 Sample recovery. With a piece of Teflon tubing identified for that bag, connect a bag inlet valve to the gas chromatograph sample valve. Switch the valve to withdraw gas from the bag through the sample loop. Plumb the equipment so the sample gas passes from the sample valve to the leak-free pump, and then to a charcoal tube, followed by a 0-100 ml/min rotameter with flow control valve.

6.4 Analysis. Set the column temperature to 100° C, the detector temperature to 150° C, and the sample loop temperature to 70° C. When optimum hydrogen and oxygen flow rates have been determined verify and maintain these flow rates during all chromatograph operations. Using zero helium or nitrogen as the carrier gas, establish a flow rate in the range consistent with the manufacturer's requirements for satisfactory detector operation. A flow rate of approximately 40 ml/min should produce adequate separations. Observe the base line periodically and determine that the noise level has stablized and that base line drift has ceased. Purge the sample loop for thirty seconds at the rate of 100 ml/min, then activate the sample valve. Record the injection time (the position of the pen on the chart at the time of sample injection), the sample number, the sample loop temperature, the column temperature, carrier gas flow rate, chart speed and the attenuator setting. Record the laboratory pressure. From the chart, select the peak having the retention time corresponding to vinyl chloride, as determined in Section 7.2. Measure the peak area, A_m, by use of a disc integrator of a planimeter. Measure the peak height. H_m. Record A_m, H_m, and the retention time. Repeat the injection at least two times or until two consecutive vinyl chloride peaks

do not vary in area more than 5%. The average value for these two areas will be used to compute the bag concentration.

Compare the ratio of H_m to A_m for the vinyl chloride sample with the same ratio for the standard peak which is closest in height. As a guideline, if these ratios differ by more than 10%, the vinyl chloride peak may not be pure (possibly acetaldehyde is present) and the secondary column should be employed (see Section 4.3.2).

6.5 Measure the ambient temperature and barometric pressure near the bag. (Assume the relative humidity to be 100 percent.) From a water saturation vapor pressure table, determine and record the water vapor content of the bag.

7. Calibration and Standards.

7.1 *Preparation of vinyl chloride standard gas mixtures.* Evacuate a sixteen-inch square Tedlar bag that has passed a leak check (described in Section 7.4) and meter in 5 liters of nitrogen. While the bag is filling, use the 0.5 ml syringe to inject 250μl of 99.9+ percent vinyl chloride through the wall of the bag. Upon withdrawing the syringe needle, immediately cover the resulting hole with a piece of adhesive tape. The bag now contains a vinyl chloride concentration of 50 ppm. In a like manner use the other syringe to prepare gas mixtures having 10 and 5 ppm vinyl chloride concentrations. Place each bag on a smooth surface and alternately depress opposite sides of the bag 50 times to further mix the gases. These gas mixture standards may be used for 10 days from the date of preparation, after which time preparation of new gas mixtures is required. (CAUTION.—Contamination may be a problem when a bag is reused if the new gas mixture standard contains a lower concentration than the previous gas mixture standard did.)

7.2 Determination of vinyl chloride retention time. This section can be performed simultaneously with Section 7.3. Establish chromatograph conditions identical with those in Section 6.3, above. Set attenuator to X 1 position. Flush the sampling loop with zero helium or nitrogen and activate the sample valve. Record the injection time, the sample loop temperature, the column temperature, the carrier gas flow rate, the chart speed and the attenuator setting. Record peaks and detector responses that occur in the absence of vinyl chloride. Maintain conditions. With the equipment plumbing arranged identically to Section 6.3, flush the sample loop for 30 seconds at the rate of 100 ml/min with one of the vinyl chloride calibration mixtures and activate the sample valve. Record the injection time. Select the peak that corresponds to vinyl chloride. Measure the distance on the chart from the injection time to the time at which the peak maximum occurs. This quantity, divided by the chart speed, is defined as the retention time record.

7.3 *Preparation of chromatograph calibration curve.* Make a gas chromatographic measurement of each gas mixture standard (described in section 5.2.2 or 7.1) using conditions identical with those listed in sections 6.3 and 6.4. Flush the sampling loop for 30 seconds at the rate of 100 ml/min with each standard gas mixture and activate the sample valve. Record C_r, the concentration of vinyl chloride injected, the attenuator setting, chart speed, peak area, sample loop temperature, column temperature, carrier gas flow rate, and retention time. Record the laboratory pressure. Calculate A_r, the peak area multiplied by the attenuator setting. Repeat until two injection areas are within 5 percent, then plot these points v. C_r. When the other concentrations have been plotted, draw a smooth curve through the points. Perform calibration daily, or before and after each set of bag samples, whichever is more frequent.

7.4 Bag leak checks. While performance of this section is required subsequent to bag use, it is also advised that it be performed prior to bag use. After each use, make sure a bag did not develop leaks as follows. To leak check, connect a water manometer and pressurize the bag to 5-10 cm H_2O(2-4 in H_2O). Allow to stand for 10 minutes. Any displacement in the water manometer indicates a leak. Also check the rigid container for leaks in this manner.

(NOTE: An alternative leak check method is to pressurize the bag to 5-10 cm H_2O or 2-4 in. H_2O and allow to stand overnight. A deflated bag indicates a leak.) For each sample bag in its rigid container, place a rotameter in-line between the bag and the pump inlet. Evacuate the bag. Failure of the rotameter to register zero flow when the bag appears to be empty indicates a leak.

8. Calculations.

8.1 Determine the sample peak area as follows:

$$A_r = A_m A_f$$

eq. 106-1

where:

A_r The sample peak area.
A_m The measured peak area.
A_f The attenuation factor.

8.2 Vinyl chloride concentrations. From the calibration curve described in Section 7.3, above, select the value of C_r that corresponds to A_r, the sample peak area. Calculate C_b as follows:

$$C_b = C_r P_r T_i / P_i T_r (1 - B_{wb})$$

eq. 106-2

where:

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B_{wb} = The water vapor content of the bag sample, as analyzed.

C_b = The concentration of vinyl chloride in the bag sample in ppm.

C_r = The concentration of vinyl chloride indicated by the gas chromatograph, in ppm.

P_r = The reference pressure, the laboratory pressure recorded during calibration, mm Hg.

T_t = The sample loop temperature on the absolute scale at the time of analysis, °K.

P_t = The laboratory pressure at time of analysis, mm Hg.

T_r = The reference temperature, the sample loop temperature recorded during calibration, °K.

9. References.

1. Brown, D. W., Loy, E. W. and Stephenson, M. H. "Vinyl Chloride Monitoring Near the B. F. Goodrich Chemical Company in Louisville, Kentucky." Region IV, U.S. Environmental Protection Agency, Surveillance and Analysis Division, Athens, Georgia, June 24, 1974.

2. "Evaluation of A Collection and Analytical Procedure for Vinyl Chloride in Air," by G. D. Clayton and Associates, December 13, 1974. EPA Contract No. 68-02-1408, Task Order No. 2, EPA Report No. 75-VCL-1.

3. "Standardization of Stationary Source Emission Method for Vinyl Chloride," by Midwest Research Institute, 1976. EPA Contract No. 68-02-1098, Task Order No. 7.

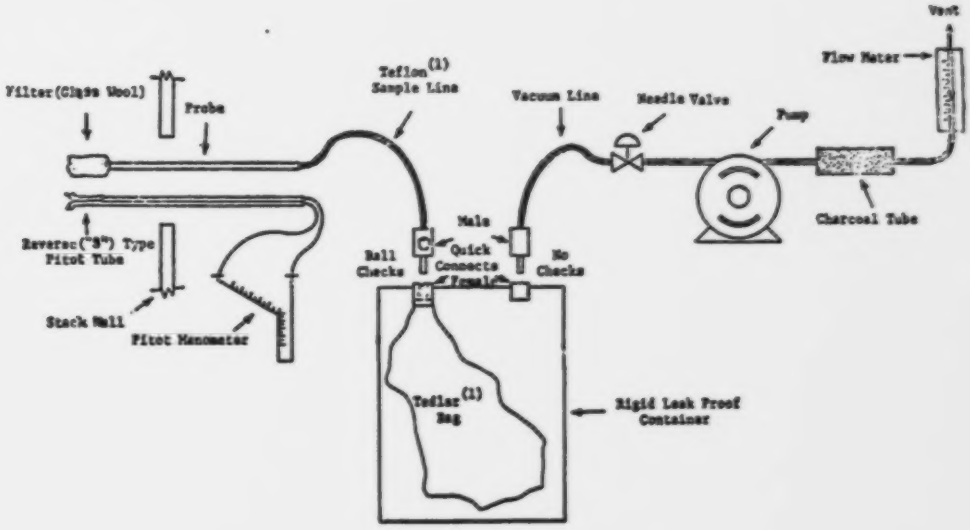

Figure 106-1. Integrated bag sampling train.

(1) Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

METHOD 107—DETERMINATION OF VINYL CHLORIDE CONTENT OF INPROCESS WASTEWATER SAMPLES, AND VINYL CHLORIDE CONTENT OF POLYVINYL CHLORIDE RESIN, SLURRY, WET CAKE, AND LATEX SAMPLES

INTRODUCTION

Performance of this method should not be attempted by persons unfamiliar with the operation of a gas chromatograph, nor by those who are unfamiliar with sampling, as there are many details that are beyond the scope of this presentation. Care must be exercised to prevent exposure of sampling personnel to vinyl chloride, a carcinogen.

1. Principle and Applicability.

1.1 The basis for this method relates to the vapor equilibrium which is established between RVCM, PVC, resin, water, and air in a closed system. It has been demonstrated that the RVCM in a PVC resin will equilibrate in a closed vessel quite rapidly, provided that the temperature of the PVC resin is maintained above the glass transition temperature of that specific resin.

1.2 This procedure is suitable for determining the vinyl choride monomer (VCM) content of inprocess wastewater samples, and the residual vinyl chloride monomer (RVCM) content of polyvinyl chloride (PVC) resins, wet cake, slurry, and latex samples. It cannot be used for polymer in fused forms, such as sheet or cubes. If a resolution of the vinyl chloride peak is not satisfactory for a particular sample, then chromatograph parameters may be altered provided that the precision and reproducibility of the analysis of vinyl chloride cylinder standards are not impaired. If there is reason to believe that some other hydrocarbon with an identical retention time is present in the sample, then supplemental confirmation of the vinyl chloride peak through an absolute analytical technique, such as mass spectroscopy, should be performed.

2. Range and Sensitivity.

The lower limit of detection of vinyl chloride will vary according to the chromatograph used. Values reported include 1×10^{-7} mg and 4×10^{-7} mg. With proper calibration, the upper limit may be extended as needed.

3. Precision and Reproducibility.

An interlaboratory comparison between seven laboratories of three resin samples, each split into three parts, yielded a standard deviation of 2.63% for a sample with a mean of 2.09 ppm, 4.16% for a sample with a mean of 1.66 ppm, and 5.29% for a sample with a mean of 62.66 ppm.

4. Safety.

Do not release vinyl chloride to the laboratory atmosphere during preparation of standards. Venting or purging with VCM/air mixtures must be held to a minimum. When they are required, the vapor must be routed to outside air. Vinyl chloride, even at low ppm levels, must never be vented inside the laboratory. After vials have been analyzed, the pressure within the vial must be vented prior to removal from the instrument turntable. Vials must be vented into an activated charcoal tube using a hypodermic needle to prevent release of vinyl chloride into the laboratory atmosphere. The charcoal must be replaced prior to vinyl chloride breakthrough.

5. Apparatus.

5.1 Sampling.

5.1.1 Bottles—60 ml (2 oz), with waxed lined screw on tops, for PVC samples.

5.1.2 Vials—50 ml Hypo-vials,[1] sealed with Teflon faced Tuf-Bond discs for water samples.

5.1.3 Electrical tape—or equivalent, to prevent loosening of bottle tops.

5.2 Sample recovery.

5.2.1 Vials—With seals and caps, Perkin-Elmer Corporation No. 105-0118, or equivalent.

5.2.2 Analytical balance—Capable of weighing to ±0.001 gram.

5.2.3. Syringe, 100 μl—Precision Series "A" No. 010025, or equivalent.

5.2.4 Vial Sealer, Perkin-Elmer No. 105-0106 or equivalent.

5.3 Analysis.

5.3.1 Gas chromatograph—Perkin-Elmer Corporation Model F-40 head-space analyzer, No. 104-0001, or equivalent.

5.3.2 *Chromatographic column.* Stainless steel, 2 m × 3.2 mm, containing 0.4 percent Carbowax 1500 on Carbopak A, Perkin-Elmer Corporation No. 105-0133, or equivalent. Carbopak C can be used in place of Carbopak A. If methanol and/or acetaldehyde is present in the sample, a pair of Poropak Q columns in series (1 m × 3.2 mm followed by 2 m × 3.2 mm) with provision for backflush of the first column has been shown to provide adequate separation of vinyl chloride.

5.3.3 Thermometer—0 to 100° C, accurate to ±0.1° C, Perkin-Elmer No. 105-0109 or equivalent.

5.3.4 Sample tray thermostat system—Perkin-Elmer No. 105-0103, or equivalent.

5.3.5 Septa—Sandwich type, for automatic dosing, 13 mm, Perkin-Elmer No. 105-1008, or equivalent.

5.3.6 Integrator-recorder—Hewlett-Packard Model 3380A, or equivalent.

5.3.7 Filter drier assembly (3)—Perkin-Elmer No. 2230117, or equivalent.

5.3.8 Soap film flowmeter—Hewlett Packard No. 0101-0113, or equivalent.

5.4 Calibration.

5.4.1 Regulators—for required gas cyinders.

6. Reagents.

6.1 Analysis.

6.1.1 Hydrogen gas—zero grade.

6.1.2 Nitrogen gas—zero grade.

6.1.3 Air—zero grade.

6.2 *Calibration.*

6.2.1 *Cylinder standards* (*4*). Gas mixture standards (50, 500, 2,000, and 4,000 ppm vinyl chloride in nitrogen cylinders) for which the gas composition has been certified by the manufacturer. Lower concentration standards should be obtained if lower concentrations of vinyl chloride samples are expected, as the intent is to bracket the sample concentrations with standards. The manufacturer must have recommended a maximum shelf life for each cylinder so that the concentration does not change greater than ±5 percent from the certified value. The date of gas cylinder preparation, certified vinyl chloride concentration and

[1]Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

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recommended maximum shelf life must have been affixed to the cylinder before shipment from the manufacturer to the buyer.

6.2.1.1 *Cylinder standards certification.* The concentration of vinyl chloride in nitrogen in each cylinder must have been certified by the manufacturer by a direct analysis of each cylinder using an analytical procedure that the manufacturer had calibrated on the day of cylinder analysis. The calibration of the analytical procedure shall, as a minimum, have utilized a three-point calibration curve. It is recommended that the manufacturer maintain two calibration standards and use these standards in the following way: (1) a high concentration standard (between 4,000 and 8,000 ppm) for preparation of a calibration curve by an appropriate dilution technique; (2) a low concentration standard (between 50 and 500 ppm) for verification of the dilution technique used.

6.2.1.2 *Establishment and verification of calibration standards.* The concentration of each calibration standard must have been established by the manufacturer using reliable procedures. Additionally, each calibration standard must have been verified by the manufacturer by one of the following procedures, and the agreement between the initially determined concentration value and the verification concentration value must be within ±5 percent: (1) verification value determined by comparison with a gas mixture standard generated in a similar manner to the procedure described in section 7.1 of Method 106 for preparing gas mixture standards using 99.9+ percent vinyl chloride, or (2) verification value obtained by having the calibration standard analyzed by the National Bureau of Standards. All calibration standards must be renewed on a time interval consistent with the shelf life of the cylinder standards sold.

7. Procedure.

7.1 Sampling.

7.1.1 PVC sampling—Allow the resin or slurry to flow from a tap on the tank or silo until the tap line has been well purged. Extend a 60 ml sample bottle under the tap, fill, and immediately tightly cap the bottle. Wrap electrical tape around the cap and bottle to prevent the top from loosening. Place an identifying label on each bottle, and record the date, time, and sample location both on the bottles and in a log book.

7.1.2 Water sampling—Prior to use, the 50 ml vials (without the discs) must be capped with aluminum foil and muffled at 400°C for at least one hour to destroy or remove any organic matter that could interfere with analysis. At the sampling location fill the vials bubble-free, to overflowing so that a convex meniscus forms at the top. The excess water is displaced as the sealing disc is carefully placed, Teflon side down, on the opening of the vial. Place the aluminum seal over the disc and the neck of the vial and crimp into place. Affix an identifying label on the bottle, and record the date, time, and sample location both on the vials and in a log book. All samples must be kept refrigerated until analyzed.

7.2 Sample recovery. Samples must be run within 24 hours.

7.2.1 Resin samples—The weight of the resin used must be between 0.1 and 4.5 grams. An exact weight must be obtained (±0.001 gram) for each sample. In the case of suspension resins a volumetric cup can be prepared which will hold the required amount of sample. The sample bottle is opened, and the cup volume of resin is added to the tared sample vial (including septum and aluminum cap). The vial is immediately sealed and the exact sample weight is then obtained. Report this value on the data sheet as it is required for calculation of RVCM. In the case of relatively dry resin samples (water content 0.3 weight %), 100 μl of distilled water must be injected into the vial, after sealing and weighing, using a 100 μl syringe. In the case of dispersion resins, the cup cannot be used. The sample is instead weighed approximately in an aluminum dish, transferred to the tared vial and weighed accurately in the vial. The sample is then placed in the Perkin-Elmer head space analyzer (or equivalent) and conditioned for one hour at 90°C.

NOTE: Some aluminum vial caps have a center section which must be removed prior to placing into sample tray. If not removed, serious damage to the injection needle will occur.

7.2.2 Suspension resin slurry and wet cake samples—Slurry must be filtered using a small Buchner funnel with vacuum to yield wet cake. The filtering process must be continued only as long as a steady stream of water is exiting from the funnel. Excessive filtration time could result in some loss of VCM. The wet cake sample (0.10 to 4.5 grams) is added to a tared vial (including septum and aluminum cap) and immediately sealed. Sample weight is then determined to 3 decimal places. The sample is then placed in the Perkin-Elmer head space analyzer (or equivalent) and conditioned for one hour at 90°C. A sample of wet cake is used to determine TS (total solids). This is required for calculating the RVCM.

7.2.3 Dispersion resin slurry samples.—This material should not be filtered. Sample must be thoroughly mixed. Using a tared vial (including septum and aluminum cap) add approximately 8 drops (0.25 to 0.35 grams) of slurry or latex using a medicine dropper. This should be done immediately after mixing. Seal the vial as soon as possible. Determine sample weight accurate to 0.001 grams. Total sample weight must not

exceed 0.50 grams. Condition the vial for one hour at 90°C in the analyzer. Determine the TS on the slurry sample (Section 7.3.5).

7.2.4 Inprocess wastewater samples—Using a tared vial (including septum and aluminum cap) quickly add approximately 1 cc of water using a medicine dropper. Seal the vial as soon as possible. Determine sample weight accurate to 0.001 gram. Condition the vial for two hours at 90°C in the analyzer.

7.3 Analysis.

7.3.1 Preparation of gas chromatograph—Install the chromatographic column and condition overnight at 150°C. Do not connect the exit end of the column to the detector while conditioning.

7.3.1.1 Flow rate adjustments—Adjust flow rates as follows:

a. Nitrogen carrier gas—Set regulator on cylinder to read 50 psig. Set regulator on chromatograph to 1.3 kg/cm^2. Normal flows at this pressure should be 25 to 40 cc/minute. Check with bubble flow meter.

b. Burner air supply—Set regulator on cylinder to read 50 psig. Set regulator on chromatograph to supply air to burner at a rate between 250 and 300 cc/minute. Check with bubble flowmeter.

c. Hydrogen supply—Set regulator on cylinder to read 30 psig. Set regulator on chromatograph to supply approximately 35±5 cc/minute. Optimize hydrogen flow to yield the most sensitive detector response without extinguishing the flame. Check flow with bubble meter and record this flow.

7.3.1.2 Temperature adjustments—Set temperatures as follows:

a. Oven (chromatographic column), 50° C.

b. Dosing line, 140°C.

c. Injection block, 140°C.

d. Sample chamber, water temperature, 90° C±1.0°C.

7.3.1.3 Ignition of flame ionization detector—Ignite the detector according to the manufacturer's instructions.

7.3.1.4 Amplifier balance—Balance the amplifier according to the manufacturer's instructions.

7.3.2 Programming the chromatograph—Program the chromatograph as follows:

a. I—Dosing time—The normal setting is 2 seconds.

b. A—Analysis time—The normal setting is 8 minutes. Certain types of samples contain high boiling materials which can cause interference with the vinyl chloride peak on subsequent analyses. In these cases the analysis time must be adjusted to eliminate the interference. An automated backflush system can also be used to solve this problem.

c. B—Flushing—The normal setting is 0.2 minutes.

d. *W—Stabilization time.* The normal setting is 0.2 minutes.

e. X Number of analyses per sample—The normal setting is 1.

7.3.3 Preparation of sample turntable—Before placing any sample into turntable, be certain that the center section of the aluminum cap has been removed. The numbered sample bottles should be placed in the corresponding numbered positions in the turntable. Insert samples in the following order:

Positions 1 & 2—Old 2000 ppm standards for conditioning. These are necessary only after the analyzer has not been used for 24 hours or longer.

Position 3—50 ppm standard, freshly prepared.

Position 4—500 ppm standard, freshly prepared.

Position 5—2000 ppm standard, freshly prepared.

Position 6—4000 ppm standard, freshly prepared.

Position 7—Sample No. 7 (This is the first sample of the day, but is given as 7 to be consistent with the turntable and the integrator printout.)

After all samples have been positioned, insert the second set of 50, 500, 2000, and 4000 ppm standards. Samples, including standards must be conditioned in the bath of 90° C for 1 hour (not to exceed 5 hours).

7.3.4 Start chromatograph program—When all samples, including standards, have been conditioned at 90° C for 1 hour, start the analysis program according to the manufacturers' instructions. These instructions must be carefully followed when starting and stopping program to prevent damage to the dosing assembly.

7.3.5 Determination of total solids (TS).

For wet cake, slurry, resin solution, and PVC latex samples, determine TS for each sample by accurately weighing approximately 3 to 4 grams of sample in an aluminum pan before and after placing in a draft oven (105 to 110° C). Samples must be dried to constant weight. After first weighing return the pan to the oven for a short period of time and then reweigh to verify complete dryness. TS is then calculated as the final sample weight divided by initial sample weight.

8. Calibration.

Calibration is to be performed each eight-hour period when the instrument is used. Each day, prior to running samples, the column should be conditioned by running two of the previous days 2000 ppm standards.

8.1 Preparation of Standards.

Calibration standards are prepared by filling the vials with the vinyl chloride/nitrogen standards, rapidly seating the septum and sealing with the aluminum cap. Use a stainless steel line from the cylinder to the vial. Do not use rubber or tygon tubing. The

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sample line from the cylinder must be purged (into hood) for several minutes prior to filling vials. After purging, reduce the flow rate to approximately 500–1000 cc/min. Place end of tubing into vial (near bottom) and after one minute slowly remove tubing. Place septum in vial as soon as possible to minimize mixing air with sample. After the standard vials are sealed, inject 100μl of distilled water.

8.2 Preparation of chromatograph calibration curve.

Prepare two 50 ppm, two 500 ppm, two 2000 ppm, and two 4000 ppm standard samples. Run the calibration samples in exactly the same manner as regular samples. Plot A_s, the integrator area counts for each standard sample vs C_c, the concentration of vinyl chloride in each standard sample. Draw a line of best fit through the points.

9. Calculations.

9.1 Response factor.

From the calibration curve described in Section 8.2, above, select the value of C_c that corresponds to A_s for each sample. Compute the response factor, R_f, for each sample, as follows:

$$R_f = A_s / C_c$$

eq. 107-1

9.2 Residual vinyl chloride monomer concentration, or vinyl chloride monomer concentration.

Calculate C_{rvc} as follows:

$$C_{rvc} = A_s P_a / R_f T_1 (M_r V_g / m_s R + K T_2)$$

eq. 107-2

where:

C_{rvc} = Concentration of vinyl chloride in the sample, in ppm.

P_a = Laboratory atmosphere pressure, mm Hg.

T_1 = Room temperature, °K.

M_r = Molecular weight of VCM (62.5).

V_g = Volume of vapor phase (vial volume less sample volume).

m_s = Weight of sample, grams.

R = Gas constant [62, 360 (cc-mm-mole-degrees Kelvin)]

K = Henry's Law constant. For VCM in PVC at 90° C. $K = 6.52 \times 10^{-6} = K_p$. For VCM in 1 cc (approximate) wastewater sample at 90° C. $K = 5.0 \times 10^{-6} = K_w$.

T_2 = Equilibration temperature, °K.

If the following conditions are met, Equation 107-2 can be simplified as follows:

1. $T_1 = 22$° C (295° K)
2. $T_2 = 90$° (363° K)
3. $P_a = 750$ mm Hg.
4. $V_g = V_t - m_s/1.4$ 23.5 $m_s/1.4$

where:

V_t = Vial volume, cc (23.5).

5. Sample contains less than 0.5 percent water.

$$C_{rvc} = A_s / R_f (4.197 \times 10^{-3} + 5.988 \times 10^{-2} / m_s)$$

eq. 107-3

The following general equation can be used for any sample which contains VCM, PVC and water.

$$C_{rvc} = A_s P_a / R_f T_1 \times [M_r V_g / R m_s + K_p (TS) T_2 + K_w (1 - TS) T_2]$$

eq. 107-4

where:

TS = Total solids.

NOTE: K_w must be determined for samples with a vapor volume to liquid volume ratio other than 22.5 to 1. This ratio can be obtained by adjusting the sample weight through giving consideration to the total solids and density of the PVC.

Results calculated using Equation 107-4 represent concentration based on the total sample. To obtain results based on dry PVC content, divide by TS.

For a 1-cc wastewater sample (that is, 22.5 to 1 vapor volume to liquid volume ratio), K_w is 5.0×10^{-6}. Thus, Equation 107-4 can be simplified to the following:

$$C_{rvc} = A_s / R_f [5.988 \times 10^{-2} / m_s + (2.066 \times 10^{-3})]$$

eq. 107-5

10. References.

a. Residual Vinyl Chloride Monomer Content of Polyvinyl Chloride Resins and Wet Cake Samples, B. F. Goodrich Chemical Co. Standard Test Procedure No. 1005-T. B. F. Goodrich Technical Center, Avon Lake, Ohio. January 30, 1975.

b. Berens, A. R., "The Solubility of Vinyl Chloride in Polyvinyl Chloride," ACS-Division of Polymer Chemistry, Polymer Preprints *15* (2): 197, 1974.

c. Berens, A. R., "The Diffusion of Vinyl Chloride in Polyvinyl Chloride," ACS-Division of Polymer Chemistry, Polymer Preprints *15* (2): 203, 1974.

d. Berens, A. R., L. B. Crider, C. J. Tomanek and J. M. Whitney, Analysis for Vinyl Chloride in PVC Powders by Head-Space Gas Chromatography," to be published.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

[38 FR 8826, Apr. 6, 1973, as amended at 40 FR 48310, Oct. 14, 1975; 41 FR 46569, Oct. 21, 1976; 41 FR 53018, Dec. 3, 1976; 42 FR 29007, June 7, 1977; 43 FR 8800, Mar. 3, 1978; 47 FR 24705, June 8, 1982]

PART 62—APPROVAL AND PROMULGATION OF STATE PLANS FOR DESIGNATED FACILITIES AND POLLUTANTS

Subpart A—General Provisions

Sec.
62.01 Definitions.
62.02 Introduction.
62.03 Extensions.
62.04 Approval status.
62.05 Legal authority.
62.06 Negative declarations.
62.07 Emissions standards, compliance schedules.
62.08 Emission inventories and source surveillance.
62.09 Revision of plans by Administrator.
62.10 Submission to Administrator.
62.11 Severability.
62.12 Availability of applicable plans.

Subpart B—Alabama

Sulfuric Acid Mist from Existing Sulfuric Aid Plants

62.100 Identification of plan.

Fluoride Emissions from Phosphate Fertilizer Plants

62.110 Indentification of plan.

Subpart C—Alaska

Fluoride Emissions From Phosphate Fertilizer Plants

62.350 Identification of plan—negative declaration.

Acid Mist From Sulfuric Acid Plants

62.351 Identification of plan—negative declaration.

Total Reduced Sulfur Emissions From Kraft Pulp Mills

62.352 Identification of plan—negative declaration.

Fluoride Emissions From Primary Aluminum Reduction Plants

62.353 Identification of plan—negative declaration.

Subpart D—[Reserved]

Subpart E—Arkansas

Plan for the Control of Designated Pollutants From Existing Facilities [Sec. 111(d) Plan]

62.850 Identification of plan.
62.852 Emission inventories, source surveillance, reports.

Fluoride Emissions From Existing Phosphate Fertilizer Plants

62.854 Identification of sources.

Sulfuric Acid Mist Emissions From Existing Sulfuric Acid Plants

62.855 Identification of sources.

Subpart F—Plan for the Control of Designated Pollutants From Existing Facilities (Sec. 111(d) Plan)

62.1100 Identification of plan.

Fluoride Emissions From Existing Phospate Fertilizer Plants

62.1101 Identification of sources.

Sulfuric Acid Mist Emissions From Existing Sulfuric Acid Production Units

62.1102 Identification of sources.

Fluoride Emissions From Primary Aluminum Reduction Plants

62.1103 Identification of pian—negative declaration.

Subpart G—[Reserved]

Subpart H—Connecticut

Flouride Emissions From Phosphate Fertilizer Plants

62.1600 Identification of plan—Negative declaration.

Sulfuric Acid Mist Emissions From Sulfuric Acid Production Units

62.1625 Identification of plan—Negative declaration.

Subpart I—Delaware

Fluoride Emissions From Phosphate Fertilizer Plants

62.1850 Identification of plan—negative declaration.

Sulfuric Acid Mist From Existing Sulfuric Acid Plants

62.1875 Identification of plan.

Subpart J—District of Columbia

Fluoride Emissions From Phosphate Fertilizer Plants

62.2100 Identification of plan—negative declaration.

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Sec.

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

62.2101 Identification of plan—negative declaration.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

62.2110 Identification of plan—negative declaration.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.2120 Identification of plan—negative declaration.

Subpart K—Florida

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

62.2350 Identification of plan.

Subpart L—Georgia

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.2600 Identification of plan—Negative declaration.

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

62.2610 Identification of plan.

Subparts M-N—[Reserved]

Subpart O—Illinois

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PRODUCTION PLANTS

62.3300 Identification of plan.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

62.3325 Identification of plan-negative declaration.

Subpart P—Indiana

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.3600 Identification of plan—Negative declaration.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.3625 Identification of plan.

Subparts Q-R—[Reserved]

Subpart S—Kentucky

Sec.

PLAN FOR THE CONTROL OF DESIGNATED POLLUTANTS FROM EXISTING FACILITIES (SEC. 111(D) PLAN)

62.4350 Identification of plan.

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

62.4351 Identification of sources.

TOTAL REDUCED SULFUR FROM EXISTING KRAFT PULP MILLS

62.4352 Identification of sources.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM REDUCTION PLANTS

62.4353 Identification of sources.

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.4354 Identification of plan negative declaration.

Subpart T—Louisiana

PLAN FOR CONTROL OF DESIGNATED POLLUTANTS FROM EXISTING FACILITIES [SEC. 111(D) PLAN]

62.4620 Identification of plan.
62.4621 Emission standards and compliance schedules.
62.4622 Emission inventories, source surveillance, reports.
62.4623 Legal authority.

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

62.4624 Identification of sources.

FLUORIDE EMISSIONS FROM EXISTING PHOSPHATE FERTILIZER PLANTS

62.4625 Identification of sources.
62.4626 Effective date.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.4627 Identification of sources.
62.4628 Effective date.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

62.4629 Identification of sources.
62.4630 Effective date.

Subpart U—Maine

Sec.

FLOURIDE EMMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.4850 Identification of plan—Negative declaration.

Subpart V—Maryland

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.5100 Identification of plan—negative declaration.

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

62.5101 Identification of plan.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

62.5110 Identification of plan.

Subpart W—Massachusetts

FLOURIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.5350 Identification of plan—Negative declaration.

Subpart X—Michigan

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.5600 Identification of plan—Negative declaration.

Subpart Y—Minnesota

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.5850 Identification of plan—Negative declaration.

Subparts Z-DD—[Reserved]

Subpart EE—New Hampshire

FLOURIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.7350 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION UNITS

62.7375 Identification of plan—Negative declaration.

Subpart FF—New Jersey

Sec.

FLOURIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.7600 Identification of plan—Negative declaration.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

62.7601 Identification of plan—Negative declaration.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM REDUCTION PLANTS

62.7602 Identification of plan—negative declaration.

Subpart GG—New Mexico

62.7850 Identification of plan.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PLANTS

62.7851 Identification of sources.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM PLANTS

62.7852 Identification of plan—Negative declaration.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

62.7853 Identification of plan—Negative declaration.

FLUORIDE EMISSIONS FROM POSPHATE FERTILIZER PLANTS

62.7854 Identification of plan—Negative declaration

Subpart HH—New York

FLOURIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.8100 Identification of plan—Negative declaration.

Subpart II—North Carolina

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

62.8350 Identification of Plan.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.8360 Identification of plan.

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Subparts JJ-KK—[Reserved]

Subpart LL—Oklahoma

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.9100 Identification of plan—Negative declaration.

Subpart MM—Oregon

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.9350 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONSFROM SULFURIC ACID PRODUCTION UNITS

62.9351 Identification of plan—Negative declaration.

Subpart NN—Pennsylvania

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.9600 Identification of plan—negative declaration.

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

62.9601 Identification of Plan.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

62.6910—62.6919 [Reserved—plan not submitted]

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.9620 Identification of plan—negative declaration.

Subpart OO—Rhode Island

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.9850 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION UNITS

62.9875 Identification of plan—Negative declaration.

Subparts PP-SS—[Reserved]

Subpart TT—Utah

FLUORIDES FROM EXISTING PHOSPHATE FERTILIZER PLANTS

62.1110 Identification of plan.

Subpart UU—Vermont

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.11350 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION UNITS

62.11375 Identification of plan—Negative declaration.

Subpart VV—Virginia

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.11600 Identification of plan—negative declaration.

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

62.11601 Identification of plan.
62.11602 Emission standards and compliance schedules.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

62.11610—62.11619 [Reserved—plan not submitted]

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

62.11620 Identification of plan—negative declaration.

Subpart WW—Washington

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.11850 Identification of plan—Negative declaration.

Subpart XX—West Virginia

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.12100 Identification of plan—negative declaration.

Subpart YY—Wisconsin

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.12350 Identification of plan—Negative declaration.

Subparts ZZ—AAA—[Reserved]

Subpart BBB—Puerto Rico

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.13100 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION PLANTS

62.13101 Identification of plan—Negative declaration.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM REDUCTION PLANTS

62.13102 Identification of plan—Negative declaration.

TOTAL REDUCED SULFUR FROM KRAFT PULP MILLS

62.13103 Identification of plan—Negative declaration.

Subpart CCC—Virgin Islands

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

62.13350 Identification of plan—Negative declaration.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION PLANTS

62.13351 Identification of plan—Negative declaration.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

62.13352 Identification of plan—Negative declaration.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM REDUCTION PLANTS

62.13353 Identification of plant—negative declaration.

AUTHORITY: Secs. 111 and 301(a), Clean Air Act, as amended (42 U.S.C. 7413 and 7601), unless otherwise noted.

SOURCE: 43 FR 51393, Nov. 3, 1978, unless otherwise noted.

Subpart A—General Provisions

§ 62.01 Definitions.

As used in this part, all terms not defined herein shall have the meaning given to them in the Clean Air Act and in Part 60 of this chapter.

§ 62.02 Introduction.

(a) This part sets forth the Administrator's approval and disapproval of State plans for control of designated pollutants and facilities, and the Administrator's promulgation of such plans or portions thereof. Approval of a plan or any portion of a plan is based on a determination by the Administrator that it meets the requirements of section 111(d) of the act and the provisions of Part 60 of this chapter.

(b) If a State does not submit a complete, approvable plan, the Administrator may then promulgate a substitute plan or part of a plan. The promulgated provision, plus the approved parts of the State plan, constitute the applicable plan for purposes of the act.

(c) The Administrator will promulgate substitute provisions for the disapproved regulatory provisions only. If a nonregulatory provision is disapproved, however, it will be noted in this part and a detailed explanation will be sent to the State.

(d) All approved regulatory provisions of each plan are incorporated by reference in this part. Section 62.12 provides information on availability of applicable plans. The Administrator and State and local agencies shall enforce (1) regulatory provisions of a plan approved or promulgated by the Administrator, and (2) all permit conditions or denials issued in carrying out the approved or promulgated regulations for the review of designated facilities.

(e) Each State's plan is dealt with in a separate subpart, with separate headings for different pollutants and facilities. The plans shall include an introductory section identifying the plan by name and the date of its submittal. Additional sections are included as necessary to specifically identify disapproved provisions, to set forth reasons for disapproval, and to set forth provisions of the plan promulgated by the Administrator. Except as otherwise specified, all supplemental information submitted to the Administrator with respect to any plan has been submitted by the Governor of the State.

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(f) Revisions to applicable plans will be included in this part when approved or promulgated by the Administrator.

§ 62.03 Extensions.

The Administrator may, whenever he determines necessary, extend the period for submission of any plan or plan revision or portion thereof.

§ 62.04 Approval status.

The approval status of each State's plan or portions thereof, are set forth in each subpart. All plans are approved unless specifically disapproved in the appropriate subpart.

§ 62.05 Legal authority.

(a) The Administrator's determination of the absence or inadequacy of legal authority required to be included in the plan is set forth in each subpart. This includes the legal authority of local agencies and State governmental agencies other than an air pollution control agency if such other agencies are assigned responsibility for carrying out a plan or portion thereof.

(b) No legal authority as such is promulgated by the Administrator. Where required regulatory provisions are not included in the plan by the State because of inadequate authority, substitute provisions are promulgated by the Administrator.

§ 62.06 Negative declarations.

A State may submit to the Administrator a letter certifying that no designated facilities exist in the State if such is the case. The negative declaration will be in lieu of a plan.

§ 62.07 Emission standards, compliance schedules.

(a) In each subpart, emission standards and compliance schedules which have been disapproved by the Administrator are identified, and those promulgated by the Administrator are set forth.

(b) The Administrator's approval or promulgation of any compliance schedule shall not affect the responsibility of the owner or operator to comply with any applicable emission limitation on or after the date for final compliance specified in the applicable schedule.

§ 62.08 Emission inventories and source surveillance.

(a) Each subpart identifies the plan provisions for source surveillance which are disapproved, and sets forth the Administrator's promulgation of necessary provisions for requiring designated sources to maintain records, make reports, and submit information.

(b) The Administrator will not promulgate provisions for disapproved State or local agency procedures for testing, inspection, investigation, or detection. However, detailed critiques of such portions will be provided to the State.

§ 62.09 Revision of plans by Administrator.

After notice and opportunity for public hearing in each affected State, the Administrator may revise any provision of an applicable plan if:

(a) The provision was promulgated by the Administrator and

(b) The plan, as revised, will be consistent with the Act and with the requirements of Part 60, Subpart B of this chapter.

§ 62.10 Submission to Administrator.

Except as otherwise provided in § 60.23 of this chapter, all requests, reports, applications, submittals, and other communications to the Administrator pursuant to this part shall be submitted in duplicate and addressed to the appropriate Regional Office of the Environmental Protection Agency, to the attention of the Director, Air and Hazardous Materials Division (Environmental Programs Division in Region II). The Regional Offices are as follows:

Region and jurisdiction covered	Address
I—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.	JFK Federal Building, Boston, Mass. 02203.
II—New York, New Jersey, Puerto Rico, Virgin Islands.	Federal Office Building, 26 Federal Plaza, New York, N.Y. 10007.
III—Delaware, District of Columbia, Pennsylvania, Maryland, Virginia, West Virginia.	Curtis Building, 6th and Walnut Sts., Philadelphia, Pa. 19106.

Region and jurisdiction covered	Address
IV—Alabama, Florida, Georgia, Mississippi, Kentucky, North Carolina, South Carolina, Tennessee.	345 Courtland NE., Atlanta, Ga. 30308.
V—Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin.	Federal Building, 230 South Dearborn St., Chicago, Ill, 60606.
VI—Arkansas, Louisiana, New Mexico, Olkahoma, Texas.	1st International Building, 1201 Elm St., Dallas, Tex. 75270.
VII—Iowa, Kansas, Missouri, Nebraska.	1735 Baltimore St., Kansas City, Mo. 64108.
VIII—Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.	916 Lincoln Towers, 1860 Lincoln St., Denver, Colo. 80203.
IX—Arizona, California, Hawaii, Nevada, Guam, American Samoa.	215 Fremont St., San Francisco, Calif. 94105.
X—Washington, Oregon, Idaho, Alaska.	1200 6th Ave., Seattle, Wash. 98101.

§ 62.11 Severability.

The provisions promulgated in this part and the various applications thereof are distinct and severable. If any provision of this part or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or application of such provision to other persons or circumstances which can be given effect without the invalid provision or application.

§ 62.12 Availability of applicable plans.

Copies of the applicable plans will be available for public inspection at the following locations:

(a) The offices of the Directors, Air and Hazardous Materials Divisions at EPA Regional Offices I, III–X, and the Director, Environmental Programs Division at EPA Regional Office II. The addresses and jurisdictions covered by these appear in § 62.10.

(b) Public Information Reference Unit, Library Systems Branch, EPA (PM 213), 401 M Street SW., Washington, D.C. 20460.

Subpart B—Alabama

Sulfuric Acid Mist from Existing Sulfuric Acid Plants

§ 62.100 Identification of plan.

(a) Title of plan: "State of Alabama Plan for Control of Sulfuric Acid Mist Emissions from Existing Sulfuric Acid Production Units."

(b) The plan was officially submitted on May 18, 1980.

(c) The plan includes the following types of sulfuric acid plants:

(1) Acid plants operated by Reichhold Chemical Company in Tuscaloosa, Stauffer Chemical Company in Mobile, and Estech Chemical in Dothan.

(2) There are no oleum plants.

(3) There are no sulfur burning plants.

(4) There are no bound sulfur feedstock plants.

[47 FR 7667, Feb. 22, 1982]

Fluoride Emissions from Phosphate Fertilizer Plants

§ 62.110 Identification of plan.

(a) Title of plan: "State of Alabama Plan for Control of Flouride Emissions from Existing Phosphate Fertilizer Plants."

(b) The plan was officially submitted on April 10, 1978.

(c) The plan currently does not identify any sources subject to its fluoride emission limits.

[47 FR 7667, Feb. 22, 1982]

Subpart C—Alaska

Source: 44 FR 76281, Dec. 26, 1979, unless otherwise noted.

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.350 Identification of plan—negative declaration.

The Alaska Department of Environmental Conservation submitted on June 9, 1977, certification that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

Acid Mist From Sulfuric Acid Plants

§ 62.351 Identification of plan—negative declaration.

The Alaska Department of Environmental Conservation submitted on

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June 9, 1977, certification that there are no existing sulfuric acid plants in the State subject to Part 60, Subpart B of this Chapter.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

§ 62.352 Identification of plan—negative declaration.

The Alaska Department of Environmental Conservation submitted on June 9, 1977, certification that there are no existing kraft pulp mills in the State subject to Part 60, Subpart B of this Chapter.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM REDUCTION PLANTS

§ 62.353 Identification of plan—negative declaration.

The Alaska Department of Environmental Conservation submitted on June 9, 1977, certification that there are no existing primary aluminum reduction plants in the State subject to Part 60, Subpart B of this Chapter.

Subpart D—[Reserved]

Subpart E—Arkansas

SOURCE: 47 FR 20491, May 12, 1982, unless otherwise noted.

EFFECTIVE DATE NOTE: At 47 FR 20491, May 12, 1982, Subpart E was added, effective July 12, 1982.

PLAN FOR THE CONTROL OF DESIGNATED POLLUTANTS FROM EXISTING FACILITIES [SEC. 111(D) PLAN]

§ 62.850 Identification of plan.

(a) Identification of plan: Arkansas Plan for the Control of Designated Pollutants from Existing Plants [Section 111(d) Plan].

(b) The plan was officially submitted as follows:

(1) Control of sulfuric acid mist from sulfuric acid plants, and fluoride emissions from phosphate fertilizer plants, submitted on July 11, 1979, having been adopted by the State on May 25, 1979, and letter dated August 6, 1981.

(c) Designated facilities: The plan applies to existing facilities in the following categories of sources:

(1) Sulfuric Acid Plants.

(2) Phosphate Fertilizer Plants.

§ 62.852 Emission inventories, source surveillance, reports.

(a) For purposes of this subpart, the terms "the applicable plan" and "the plan" in 40 CFR 52.178(b), which provides for public availability of emission data, include this plan.

FLUORIDE EMISSIONS FROM EXISTING PHOSPHATE FERTILIZER PLANTS

§ 62.854 Identification of sources.

The plan applies to existing facilities at the following existing phosphate fertilizer plant:

(1) Allied Chemical Company at Helena, Arkansas.

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

§ 62.855 Identification of sources.

(a) The plan applies to existing facilities at the following existing sulfuric acid plants:

(1) Olin Corporation in North Little Rock, Arkansas.

(2) The Monsanto Company in Eldorado, Arkansas.

Subpart F—Plan for the Control of Designated Pollutants From Existing Facilities (Sec. 111(d) Plan)

AUTHORITY: Section 111 of the Clean Air Act, as amended (42 U.S.C. 7411).

SOURCE: 47 FR 28100, June 29, 1982, unless otherwise noted.

EFFECTIVE DATE NOTE: At 47 FR 28100, June 29, 1982, Subpart F was added, effective July 29, 1982.

§ 62.1100 Identification of plan.

(a) State of California Designated Facility Plan (Section 111(d) Plan).

(b) The plan was officially submitted as follows:

(1) Control of fluoride emissions from existing facilities at phosphate fertilizer plants, submitted on February 26 and July 16, 1979 and April 7, 1980 having been adopted by the Districts on December 1 and 6, 1979 and January 9, 1979. A letter clarifying the plan was submitted on March 27, 1979.

Revisions to the plan were submitted on September 23, 1980 and February 5 and July 6, 1981.

(2) Control of sulfuric acid mist from existing facilities at sulfuric acid production units, submitted on February 26, July 16, and September 7, 1979 and April 7, 1980, having been adopted by the Districts on December 1 and 6, 1978 and January 9, 1979. Revisions to the plan were submitted on October 31, 1980, February 18, and May 1, 1981.

(c) Designated facilities: The plans apply to existing facilities in the following categories of sources:

(1) Existing phosphate fertilizer plants

(2) Existing sulfuric acid production units

FLUORIDE EMISSIONS FROM EXISTING PHOSPHATE FERTILIZER PLANTS

§ 62.1101 Identification of sources.

The plan applies to existing facilities at the following phosphate fertilizer plants:

(a) Occidental Chemical Company in San Joaquin County

(b) Simplot Company in Kings County

(c) Valley Nitrogen Products, Inc., in Fresno County

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PRODUCTION UNITS

§ 62.1102 Identification of sources.

The plan applies to existing facilities at the following sulfuric acid production units:

(a) Allied Chemical Corporation in Alameda County

(b) Monsanto Company in Alameda County

(c) Occidental Chemical Company in Fresno County

(d) Stauffer Chemical Company in Alameda County

(e) Valley Nitrogen Products, Inc. in Kern County

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM REDUCTION PLANTS

§ 62.1103 Identification of plan—negative declaration

Subpart G—[Reserved]

Subpart H—Connecticut

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.1600 Identification of plan—Negative declaration.

The State Department of Environmental Protection submitted on November 30, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept. 18, 1979]

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION UNITS

§ 62.1625 Identification of plan—Negative declaration.

The State Department of Environmental Protection submitted on November 30, 1977, a letter certifying that there are no existing sulfuric acid plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept. 18, 1979]

Subpart I—Delaware

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.1850 Identification of plan—negative declaration.

The Delaware Department of Natural Resources and Environmental Control submitted on November 7, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this chapter.

[45 FR 43412, June 27, 1980]

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SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

§ 62.1875 Identification of plan.

(a) Title of plan: State implementation plan for control of sulfuric acid mist from existing sulfuric acid plants.

(b) The plan was officially submitted on September 8, 1978 with amendments submitted on December 29, 1980.

(c) Indentification of Sources: The plan includes the following sulfuric acid plants:

(1) Allied Chemical Company, Claymont (New Castle County).

[47 FR 10536, Mar. 11, 1982]

Subpart J—District of Columbia

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.2100 Identification of plan—negative declaration.

The Department of Environmental Services submitted on December 12, 1977 a letter certifying that there are no existing phosphate fertilizer plants in the District subject to Part 60, Subpart B of this chapter.

[45 FR 43412, June 27, 1980]

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

§ 62.2101 Identification of plan—negative declaration.

The Director, Department of Environmental Services submitted on March 7, 1978 a letter certifying there are no existing sulfuric acid production units in the District subject to Part 60, Subpart B of this chapter.

[46 FR 41783, Aug. 18, 1981]

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

§ 62.2110 Identification of plan—negative declaration.

The Mayor of the District of Columbia submitted on July 16, 1980 a letter certifying there are no existing primary kraft pulp mills in the District subject to Part 60, Subpart B of this chapter.

[46 FR 41783, Aug. 18, 1981]

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

§ 62.2120 Identification of plan—negative declaration.

The Mayor of the District of Columbia submitted on May 29, 1980 a letter certifying there are no existing primary aluminum plants in the District subject to Part 60, Subpart B of this chapter.

[46 FR 41783, Aug. 18, 1981]

Subpart K—Florida

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

§ 62.2350 Identification of plan.

(a) Title of plan: "State of Florida Plan for Control of Sulfuric Acid Mist Emissions from Existing Sulfuric Acid Production Units."

(b) The plan was officially submitted on December 14, 1978.

(c) The plan includes the following types of sulfuric acid plants.

(1) Acid plants operated by Occidental Petroleum Company in Hamilton County, AMAX Phosphate Inc. in Manatee County, Conserv Chemical in Nichols, Farmland Industry in Bartow County, W.R. Grace Company in Polk County, Royster Fertilizer in Polk County, USS Agrichemicals in Polk County, Central Farmers Co-op in Polk County, Agrico Chemical Company in Polk County, Gardinier, Inc., in Hillsborough County, and ESTECH in Polk County.

(2) There are no oleum plants.

(3) There are no sulfur burning plants.

(4) There are no bound sulfur feedstock plants.

[47 FR 7667, Feb. 22, 1982]

Subpart L—Georgia

Fluoride Emissions from Phosphate Fertilizer Plants

§ 62.2600 Identification of plan—Negative declaration.

The Georgia Environmental protection Division submitted on July 14, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B, of this chapter.

(Secs. 111 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411 and 7601(a)))

[47 FR 23163, May 27, 1982]

Effective Date Note: At 47 FR 23163, May 27, 1982, § 62.2600 was added, effective July 26, 1982.

Sulfuric Acid Mist from Existing Sulfuric Acid Plants

§ 62.2610 Identification of plan.

(a) Title of plan: Untitled.

(b) The plan was officially submitted on January 31, 1978.

(c) The plan applies to the following types of sulfuric acid plant:

(1) Sulfur-burning plants of American Cyanamid Company in Savannah and Cities Service Company in Augusta.

(2) Oleum plant of Cities Service Company in Augusta.

(3) There are no bound sulfur feedstock plants.

(Secs. 111 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7411 and 7601(a)))

[47 FR 23163, May 27, 1982]

Effective Date Note: At 47 FR 23163, May 27, 1982, § 62.2610 was added, effective July 26, 1982.

Subparts M–N [Reserved]

Subpart O—Illinois

Sulfuric Acid Mist Emissions From Existing Sulfuric Acid Production Plants

§ 62.3300 Identification of plan.

(a) Title of Plan: "Illinois Plan for the Control of Sulfuric Acid Mist from Existing Contract Process Sulfuric Acid Plants."

(b) The plan was officially submitted on August 10, 1978.

(c) Identification of sources: The plan includes the following sulfuric acid production plants:

(1) Beker Industries in LaSalle County

(2) U.S.I. Chemical Company in Douglas County

(3) Mobil Chemical Company in Bureau County

(4) Swift Chemical Company in Cook County

(5) American Cyanamid Company in Will County

(6) Amax Zinc Company in St. Clair County

(7) Monsanto Company in St. Clair County

(8) Smith Douglas—Division of Border Chemical in Livingston County

[46 FR 57896, Nov. 27, 1981]

Total Reduced Sulfur Emissions From Kraft Pulp Mills.

§ 62.3325 Identification of Plan—Negative Declaration.

The Illinois Environmental Protection Agency submitted on July 23, 1979, a letter certifying that there are no existing kraft pulp mills in the State subject to Part 60, Subpart B of this chapter.

[46 FR 57896 Nov. 27, 1981]

Subpart P—Indiana

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.3600 Identification of plan—Negative declaration.

The State Board of Health submitted on April 18, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this chapter.

Floride Emissions From Existing Primary Aluminum Plants

§ 62.3625 Identification of plan.

(a) Title of plan: "Fluoride Emission Limitations for Existing Primary Aluminum Plants."

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(b) The plan was officially submitted on January 7, 1981 by the Technical Secretary of the Indiana Air Pollution Control Board.

(c) The State on July 17, 1981, submitted Alcoa methods 4075A, 4076A, 913A, 914E and 914F as alternate test methods.

[46 FR 57896, Nov. 27, 1981, as amended at 46 FR 57897, Nov. 27, 1981]

Subparts Q–R—[Reserved]

Subpart S—Kentucky

SOURCE: 47 FR 22956, May 26, 1982, unless otherwise noted.

EFFECTIVE DATE NOTE: At 47 FR 22956, May 26, 1982, Subpart S was added, effective July 26, 1982.

PLAN FOR THE CONTROL OF DESIGNATED POLLUTANTS FROM EXISTING FACILITIES (SEC. 111(D) PLAN)

§ 62.4350 Identification of plan.

(a) Identification of plan: Kentucky Designated Facility Plan (Section 111(d) Plan).

(b) The plan was officially submitted as follows:

(1) Control of sulfuric acid mist emissions from existing facilities at sulfuric acid plants, total reduced sulfur emissions from existing facilities at kraft pulp mills, fluoride emissions from existing facilities at primary aluminum reduction plants, officially submitted on December 15, 1981.

(c) Designated facilities: The plan applies to existing facilities in the following categories of sources:

(1) Sulfuric acid plants.

(2) Kraft pulp mills.

(3) Primary aluminum reduction plants.

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

§ 62.4351 Identification of sources.

The plan applies to existing facilities at the following sulfuric acid plant: E.I. du Pont sulfuric acid plant in Wurtland, Ky.

TOTAL REDUCED SULFUR FROM EXISTING KRAFT PULP MILLS

§ 62.4352 Identification of sources.

The plan applies to existing facilities at the following kraft pulp mills:

(a) Westvaco Corp., Fine Papers Division, Wickliffe, Ky.

(b) Willamette Industries, Corrugated Medium Mill and Bleached Pulp Mill, Hawesville, Kentucky.

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM REDUCTION PLANTS

§ 62.4353 Identification of sources.

The plan applies to existing facilities at the following primary aluminum reduction plants:

(a) National Southwire Aluminum, Hawesville, Ky.

(b) Anaconda Company, Aluminum Division, Henderson, Ky.

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.4354 Identification of plan—Negative declaration.

The Kentucky Department for Natural Resources and Environmental Protection certified in a letter dated August 25, 1978, that Kentucky has no designated facilities in this source category.

Subpart T—Louisiana

SOURCE: 44 FR 54053, Sept. 18, 1979, unless otherwise noted.

PLAN FOR CONTROL OF DESIGNATED POLLUTANTS FROM EXISTING FACILITIES [SEC. 111(D) PLAN]

§ 62.4620 Identification of plan.

(a) Identification of plan: Louisiana Plan for Control of Designated Pollutants from Existing Facilities [111(d) Plan].

(b) The plan was officially submitted as follows:

(1) Control of sulfuric acid mist from sulfuric acid plants, and fluoride emissions from existing facilities at phosphate fertilizer plants, submitted on July 18, 1978, having been adopted by

the State November 30, 1977, and letter dated February 16, 1982.

(2) Control of fluoride emissions from existing facilities at primary aluminum plants, submitted on January 12, 1981, having been adopted by the State on December 11, 1980.

(3) Control of total reduced sulfur from existing facilities at kraft pulp mill plants, submitted in December 1979, having been adopted November 27, 1979, and letter dated February 16, 1982.

(c) Designated facilities: The plan applies to existing facilities in the following categories of sources:

(1) Sulfuric Acid Plants.

(2) Phosphate Fertilizer Plants.

(3) Primary Aluminum Plants.

(4) Kraft Pulp Mills.

[47 FR 20491—20493, May 12, 1982]

EFFECTIVE DATE NOTE: At 47 FR 20491—20493, May 12, 1982, the undesignated center heading above § 62.4620 and § 62.4620 was revised, effective July 12, 1982. For the convenience of the user, the superseded text appears below.

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

§ 62.4620 Identification of plan.

(a) Title of plan: "Control of Sulfuric Acid Mist from Existing Sulfuric Acid Production Units."

(b) The plan was officially submitted on July 18, 1978.

(c) Identification of sources: The plan includes the following sulfuric acid plants:

(1) Agrico Chemical Company in St. James Parish.

(2) Allied Chemical Corporation in Ascension and Iberville Parishes.

(3) Beker Industries in St. Charles Parish.

(4) Cities Services Oil Company in Calcasieu Parish.

(5) E. I. du Pont de Nemours & Company, Inc. in Ascension Parish.

(6) Freeport Chemical Company in St. James Parish.

(7) Freeport Chemical Company in Plaquemines Parish.

(8) Olin Corporation in Caddo Parish.

(9) Stauffer Chemical Company in East Baton Rouge Parish.

§ 62.4621 Emission standards and compliance schedules.

(a) The requirements of § 60.24(b)(2) of this chapter are not met since the test methods and procedures for determining compliance with the sulfuric acid mist emission standards are not specified.

(b) Emissions from sulfuric acid plants must be measured by the methods in Appendix A to Part 60, or by equivalent or alternative methods as defined in § 60.2 (t) and (u) respectively.

§ 62.4622 Emission inventories, source surveillance, reports.

(a) The requirements of § 60.25(a) of this chapter are not met since the emission inventories do not provide information as specified in Appendix D to Part 60.

(b) The requirements of § 60.25(c) of this chapter are not met since the plan does not provide for the disclosure of emission data, as correlated with applicable emission standards, to the general public.

(c) *Regulation for Public Availability of Emission Data.* (1) Any person who cannot obtain emission data from the agency responsible for making emission data available to the public, as specified in the applicable plan, concerning emissions from any souce subject to emission limitations which are part of the approved plan may request that the appropriate Regional Administrator obtain and make public such data. Within 30 days after receipt of any such written request, the Regional Administrator shall require the owner or operator of any such source to submit information within 30 days on the nature and amounts of emissions from such source and any other information as may be deemed necessary by the Regional Administrator to determine whether such source is in compliance with applicable emission limitations or other control measures that are part of the applicable plan.

(2) Commencing after the initial notification by the Regional Administrator pursuant to paragraph (c)(1) of this section, the owner or operator of the source shall maintain records of the nature and amounts of emissions from such source and any other information as may be deemed necessary by the Regional Administrator to determine whether such source is in compliance with applicable emission limitations or other control measures

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that are part of the plan. The information recorded shall be summarized and reported to the Regional Administrator, on forms furnished by the Regional Administrator, and shall be submitted within 45 days after the end of the reporting period. Reporting periods are January 1–June 30 and July 1–December 31.

(3) Information recorded by the owner or operator and copies of this summarizing report submitted to the Regional Administrator shall be retained by the owner or operator for 2 years after the date on which the pertinent report is submitted.

(4) Emission data obtained from owners or operators of stationary sources will be correlated with applicable emission limitations and other control measures that are part of the applicable plan and will be available at the appropriate regional office and at other locations in the State designated by the Regional Administrator.

§ 62.4623 Legal authority.

(a) The requirements of § 60.26(a) of this chapter are not met since the plan does not provide adequate legal authority for the State to make emission data, as correlated with applicable emissions standards, available to the general public.

Sulfuric Acid Mist From Existing Sulfuric Acid Plants

§ 62.4624 Identification of sources.

Identification of sources: The plan includes the following sulfuric acid plants:

(1) Agrico Chemical Company in St. James Parish.

(2) Allied Chemical Corporation in Ascension and Iberville Parishes.

(3) Beker Industries in St. Charles Parish.

(4) Cities Services Oil Company in Calcasieu Parish.

(5) E. I. du Pont de Nemours & Company, Inc. in Ascension Parish.

(6) Freeport Chemical Company in St. James Parish.

(7) Freeport Chemical Company in Plaquemines Parish.

(8) Olin Corporation in Caddo Parish.

(9) Stauffer Chemical Company in East Baton Rouge Parish.

[44 FR 54053, Sept. 18, 1979. Redesignated at 47 FR 20491, May 12, 1982]

Effective Date Note: At 47 FR 20491, May 12, 1982, § 62.4620(c) was redesignated as § 62.4624, effective July 12, 1982.

Fluoride Emissions From Existing Phosphate Fertilizer Plants

§ 62.4625 Identification of sources.

(a) The Plan applies to existing facilities at the following phosphate fertilizer plants:

(1) Agrico Chemical Company at Donaldsville, Louisiana.

(2) Allied Chemical Corporation at Geismar, Louisiana.

(3) Beker Industries at Taft, Louisiana.

(4) Freeport Chemical at Uncle Sam, Louisiana.

(5) Monsanto at Luling, Louisiana.

[47 FR 20491, May 12, 1982]

Effective Date Note: At 47 FR 20491, May 12, 1982, § 62.4625 was added, effective July 12, 1982.

§ 62.4626 Effective date.

(a) The effective date of the portion of the plan applicable to phosphate fertilizer plants is July 12, 1982.

[47 FR 20491, May 12, 1982]

Effective Date Note: At 47 FR 20491, May 12, 1982, § 62.4626 was added, effective July 12, 1982.

Fluoride Emissions From Existing Primary Aluminum Plants

§ 62.4627 Identification of sources.

The plan applies to existing facilities at the following primary aluminum plants:

(1) The Kaiser Plant at Chalmette, Louisiana.

(2) The CONALCO Plant at Lake Charles, Louisiana.

[47 FR 20492, May 12, 1982]

Effective Date Note: At 47 FR 20492, May 12, 1982, § 62.4627 was added, effective July 12, 1982.

§ 62.4628 Effective date.

The effective date of this portion of the State's plan is July 12, 1982.

[47 FR 20492, May 12, 1982]

EFFECTIVE DATE NOTE: At 47 FR 20492, May 12, 1982, § 62.4628 was added, effective July 12, 1982.

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

§ 62.4629 Identification of sources.

The plan applies to existing facilities at the following kraft pulp mill plants:

(1) Boise at DeRidder, La.
(2) Boise at Elizabeth, La.
(3) Continental at Hodge, La.
(4) Crown-Zellerbach at Bogalusa, La.
(5) Crown-Zellerbach at St. Francisville, La.
(6) Georgia-Pacific at Port Hudson, La.
(7) International Paper at Bastrop, La.
(8) Olinkraft at West Monroe, La.
(9) Pineville Kraft at Pineville, La.
(10) Western Kraft at Compte, La.

[47 FR 20493, May 12, 1982]

EFFECTIVE DATE NOTE: At 47 FR 20493, May 12, 1982, § 62.4629 was added, effective July 12, 1982.

§ 62.4630 Effective date.

The effective date of the portion of the plan applicable to kraft pulp mills is July 12, 1982.

[47 FR 20493, May 12, 1982]

EFFECTIVE DATE NOTE: At 47 FR 20493, May 12, 1982, § 62.4630 was added, effective July 12, 1982.

Subpart U—Maine

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.4850 Identification of plan—Negative declaration.

The State Department of Environmental Protection submitted on April 19, 1978, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept 18, 1979]

Subpart V—Maryland

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.5100 Identification of plan—negative declaration.

The Maryland Department of Health and Mental Hygiene, Environmental Health Administration submitted on July 11, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this cxhapter.

[45 FR 43412, June 27, 1980]

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

§ 62.5101 Identification of plan.

(a) Title of plan: "Control of Sulfuric Acid Mist From Existing Sulfuric Acid Production Units."
(b) The plan was officially submitted by the Secretary of Health and Mental Hygiene, State of Maryland on August 30, 1978.
(c) Identification of sources: The plan includes the following sulfuric acid plants:
Olin Corporation, Baltimore City, Maryland.

[46 FR 62852, Dec. 29, 1981]

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

§ 62.5110 Identification of plan.

(a) Title of Plan: "Control of Kraft Pulp Mill TRS Emissions."
(b) The plan was officially submitted by the Governor of Maryland on May 18, 1981.
(c) Identification of sources:

Westvaco, Fine Papers Division, Luke, Maryland.

[47 FR 20128, May 11, 1982]

Subpart W—Massachusetts

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.5350 Identification of plan—Negative declaration.

The State Department of Environmental Quality Engineering submitted

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on April 12, 1978, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept 18, 1979]

Subpart X—Michigan

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.5600 Identification of plan—Negative declaration.

The State Department of Resources submitted on April 18, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

Subpart Y—Minnesota

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.5850 Identification of plan—Negative declaration.

The State Pollution Control Agency submitted on April 7, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

Subparts Z-DD—[Reserved]

Subpart EE—New Hampshire

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.7350 Identification of plan—Negative declaration.

The State Air Pollution Control Agency submitted on November 29, 1978, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept 18, 1979]

Sulfuric Acid Mist Emissions From Sulfuric Acid Production Units

§ 62.7375 Identification of plan—Negative declaration.

The State Air Pollution Control Agency submitted on November 29, 1978, a letter certifying that there are no existing sulfuric acid plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept 18, 1979]

Subpart FF—New Jersey

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.7600 Identification of plan—Negative declaration

The New Jersey Department of Environmental Protection submitted, on May 20, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

[44 FR 41180, July 16, 1979]

Total Reduced Sulfur Emissions From Kraft Pulp Mills

§ 62.7601 Identification of plan—Negative declaration.

The New Jersey Department of Environmental Protection submitted, on October 18, 1979, a letter certifying that there are no existing kraft pulp mills in the State subject to Part 60, Subpart B of this chapter.

[45 FR 80826, Dec. 8, 1980; 46 FR 27342, May 19, 1981]

Fluoride Emissions From Primary Aluminum Reduction Plants

§ 62.7602 Identification of plan—negative declaration.

The New Jersey Department of Environmental Protection submitted, on September 29, 1980, a letter certifying that there are no existing primary aluminum plants in the State subject to Part 60 Subpart B of this chapter.

[46 FR 30479, June 9, 1981]

Subpart GG—New Mexico

SOURCE: 47 FR 10005, Mar. 9, 1982, unless otherwise noted.

§ 62.7850 Identification of plan.

(a) Title of plan: "State of New Mexico Designated Facility Plan" (§ 111(d)).

(b) The plan was officially submitted as follows:

(1) Sulfuric acid plants on May 15, 1981.

(c) Affected facilities: The plan includes the following facilities:

(1) Sulfuric acid plants.

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PLANTS

§ 62.7851 Identification of sources.

(a) The plan includes the following sources:

(1) Kerr-McGee Nuclear Corporation in McKinley County.

(2) Climax Chemical Corporation in Lea County.

FLUORIDE EMISSIONS FROM PRIMARY ALUMINUM PLANTS

§ 62.7852 Identification of plan—Negative declaration.

The New Mexico Environmental Improvement Division and the Albuquerque Air Pollution Control Division submitted letters of July 8, 1980 and September 23, 1980, respectively, certifying that there are no existing primary aluminum plants in the State subject to Part 60, Subpart B of this chapter.

TOTAL REDUCED SULFUR EMISSIONS FROM KRAFT PULP MILLS

§ 62.7853 Identification of plan—Negative declaration.

The New Mexico Environmental Improvement Division and the Albuquerque Air Pollution Control Division submitted letters of November 5, 1979 and July 8, 1980, respectively, certifying that there are no existing kraft pulp mills in the State subject to Part 60, Subpart B of this chapter.

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.7854 Identification of plan—Negative declaration.

The State Department of Health and Social Services submitted on October 31, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

[43 FR 51393, Nov. 3, 1978. Redesignated at 47 FR 10005, Mar. 9, 1982]

Subpart HH—New York

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.8100 Identification of plan—Negative declaration.

The New York State Department of Environmental Conservation submitted, on May 12, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

[44 FR 41180, July 16, 1979]

Subpart II—North Carolina

SULFURIC ACID MIST FROM EXISTING SULFURIC ACID PLANTS

§ 62.8350 Identification of plan.

(a) Untitled.

(b) The plan was officially submitted on October 27, 1978, and November 14, 1979.

(c) The plan includes the following sulfuric acid plants:

(1) Sulfur-burning plants operated by Texasgulf, Inc. in Beaufort County, Swift Agricultural Chemical Corporation in Brunswick County, USS Agri-Chemicals in Brunswick County, Wright Chemical Corporation in Columbus County, and Northeast Chemical Company in New Hanover County.

(2) There are no oleum plants.

(3) There are no bound sulfur feedstock plants.

[46 FR 62853, Dec. 29, 1981]

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FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

§ 62.8360 Identification of plan.

(a) Untitled.

(b) The plan was officially submitted on April 16, 1981; supplemental information was submitted on August 24, 1981.

(c) The plan applies to two potlines of prebake cells at the Badin (Stanly County) facility of the Aluminum Corporation of America.

[46 FR 62853, Dec. 29, 1981]

Subparts JJ–KK—[Reserved]

Subpart LL—Oklahoma

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.9100 Identification of plan—Negative declaration.

The State Department of Health submitted on October 25, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

Subpart MM—Oregon

FLOURIDE EMMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.9350 Identification of plan—Negative declaration.

The Oregon State Deparetment of Environmental Quality submitted on June 1, 1977, certification that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

[44 FR 76281, Dec. 26, 1979]

SULFURIC ACID MIST EMISSIONS FROM SULFURIC ACID PRODUCTION UNITS

§ 62.9351 Identification of plan—Negative declaration.

The Oregon State Deparetment of Environmental Quality submitted on January 27, 1978, certification that there are no existing sulfuric acid plants in the State subject to Part 60, Subpart B of this Chapter.

[44 FR 76281, Dec. 26, 1979]

Subpart NN—Pennsylvania

FLUORIDE EMISSIONS FROM PHOSPHATE FERTILIZER PLANTS

§ 62.9600 Identification of plan—negative declaration.

(a) The Pennslyvania Department of Environmental Resources submitted on December 1, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

(b) The Allegheny County Bureau of Air Pollution Control submitted a letter on August 18, 1978 certifying that there are no phosphate fertilizer plants in the County subject to part 60, Subpart B of this Chapter.

[47 FR 5900, Feb. 9, 1982]

SULFURIC ACID MIST EMISSIONS FROM EXISTING SULFURIC ACID PLANTS

§ 62.9601 Identification of Plan.

(a) The Allegheny County Bureau of Air Pollution Control submitted a letter on August 18, 1978 certifying that there are no sulfuric acid plants in the County subject to Part 60, Subpart B of this Chapter.

(b) A plan for the control of sulfuric acid mist emissions from existing sulfuric acid plants in the Commonwealth of Pennsylvania, submitted on May 30, 1978 and supplemented on August 17, 1981.

[47 FR 5900, Feb. 9, 1982]

TOTAL REDUCED SULFUR EMISSIONS FROM EXISTING KRAFT PULP MILLS

§§ 62.9610—62.9619 [Reserved—plan not submitted]

FLUORIDE EMISSIONS FROM EXISTING PRIMARY ALUMINUM PLANTS

§ 62.9620 Identification of plan—negative declaration.

The Secretary, Department of Environmental Resources submitted on November 3, 1980, a letter certifying there are no primary aluminum plants in the Commonwealth of Pennsylvania

subject to Part 60, Subpart B of this chapter.

[46 FR 41783, Aug. 18, 1981]

Subpart OO—Rhode Island

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.9850 Identification of plan—Negative declaration.

The State Department of Environmental Management submitted on November 14, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept. 18, 1979]

Sulfuric Acid Mist Emissions From Sulfuric Acid Production Units

§ 62.9875 Identification of plan—Negative declaration.

The State Department of Environmental Management submitted on November 14, 1977, a letter certifying that there are no existing sulfuric acid plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept. 18, 1979]

Subparts PP–SS—[Reserved]

Subpart TT—Utah

Fluorides From Existing Phosphate Fertilizer Plants

§ 62.1110 Identification of plan.

(a) *Title of plan:* "Control of Fluorides from Existing Phosphate Plants".

(b) The plan was officially submitted on March 1, 1982.

(c) *Identification of Source:* The plan includes the Chevron Chemical Company's phosphate fertilizer plant in Magna, Utah.

[47 FR 25336, June 11, 1982]

Editorial Note: Section 62.1110 set forth above was incorrectly codified at 47 FR 25336, June 11, 1982, effective August 10, 1982. A document correctly codifying § 62.1110 will be published in the Federal Register at a later date.

Subpart UU—Vermont

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.11350 Identification of plan—Negative declaration.

The State Agency of Environmental Conservation submitted on April 11, 1978, a letter certifying that there are no existing phosphate fertilizer plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54052, Sept. 18, 1979]

Sulfuric Acid Mist Emissions From Sulfuric Acid Production Units

§ 62.11375 Identification of plan—Negative declaration.

The State Agency of Environmental Conservation submitted on April 11, 1978, a letter certifying that there are no existing sulfuric acid plants in the state subject to Part 60, Subpart B of this chapter.

[44 FR 54053, Sept. 18, 1979]

Subpart VV—Virginia

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.11600 Identifaction of plan—negative declaration.

The Secretary of Commerce and Resources, Office of the Governor submitted on May 13, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this chapter.

[45 FR 43412, June 27, 1980]

Sulfuric Acid Mist Emissions From Existing Sulfuric Acid Plants

§ 62.11601 Identification of plan.

(a) Title of plan: Commonwealth of Virginia State Implementation Plan under Section 111(d) of the Clean Air Act for the Designated Facility—Sulfuric Acid Plants.

(b) The plan was officially submitted by the Secretary of Commerce and Resources, Commonwealth of Virginia, on September 29, 1978.

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(c) The plan is approved except that no action is being taken on the monitoring and source surveillance procedures (section 4.04 of the Virginia Air Quality Control Regulations) and the notification, records and reporting procedures (section 4.05 of the Virginia Air Quality Control Regulations) which will be acted on separately under Part 52.

(d) Identification of sources: The plan includes the following sulfuric acid plants:

Allied Chemical, Hopewell
Allied Chemical, Front Royal
Du Pont, James River
Smith Douglas, Chesapeake
U.S. Army Ammo. Plant, Radford
Weaver Fertilizer, Norfolk

(e) A variance issued to the E. I. du Pont de Nemours and Company James River Sulfuric Acid Plant located in Chesterfield County, Virginia exempting the plant from Section 4.51(c)(2) until December 15, 1981, submitted on October 21, 1980 by the Virginia Secretary of Commerce and Resources.

[46 FR 55973, Nov. 13, 1981, as amended at 46 FR 55975, Nov. 13, 1981]

§ 62.11602 Emission standards and compliance schedules.

(a) The requirements of § 60.25 (b) and (c) of this chapter are not met since EPA is taking separate action on §§ 4.04 and 4.05 and Appendix J under Part 52 of this Title.

[46 FR 55974, Nov. 13, 1981]

Total Reduced Sulfur Emissions From Existing Kraft Pulp Mills

§§ 62.11610—62.11619 [Reserved—plan not submitted]

Fluoride Emissions From Existing Primary Aluminum Plants

§ 62.11620 Identification of plan—negative declaration.

The Commonwealth of Virginia, Office of the Governor, submitted on July 9, 1980, a letter certifying that there are no designated facilities in the Commonwealth subject to the emission guidelines set forth in the Final Guideline Document for the Control of Fluoride Emissions from Existing Primary Aluminum Plants.

[46 FR 41783, Aug. 18, 1981]

Subpart WW—Washington

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.11850 Identifaction of plan—negative declaration.

The Washington State Department of Ecology submitted on August 29, 1979, certification that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this chapter.

[44 FR 76281, Dec. 26, 1979]

Subpart XX—West Virginia

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.12100 Identification of plan—negative declaration.

The West Virginia Air Pollution Control Commission submitted on October 25, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this chapter.

[45 FR 43412, June 27, 1980]

Subpart YY—Wisconsin

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.12350 Identification of plan—Negative declaration.

The State Department of Natural Resources submitted on May 24, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the State subject to Part 60, Subpart B of this Chapter.

Subparts ZZ-AAA—[Reserved]

Subpart BBB—Puerto Rico

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.13100 Identification of plan—Negative declaration

The Commonwealth Environmental Quality Board submitted, on January 31, 1978, a letter certifying that there are no existing phosphate fertilizer plants in Commonwealth subject to Part 60, Subpart B of this Chapter.

[44 FR 41180, July 16, 1979]

Sulfuric Acid Mist Emissions From Sulfuric Acid Plants

§ 62.13101 Identification of plan—Negative declaration.

The Commonwealth Environmental Quality Board submitted, on January 31, 1978, a letter certifying that there are no existing sulfuric acid plants in the Commonwealth subject to Part 60, Subpart B of this chapter.

[45 FR 37432, June 3, 1980; 46 FR 27342, May 19, 1981]

Fluoride Emissions From Primary Aluminum Reduction Plants

§ 62.13102 Identification of plan—Negative declaration.

The Commonwealth of Puerto Rico submitted on April 28, 1981, a letter certifying that there are no existing primary aluminum plants in the Commonwealth subject to Part 60 Subpart B of this chapter.

[46 FR 43834, Sept. 1, 1981]

Total Reduced Sulfur From Kraft Pulp Mills

§ 62.13103 Identification of plan—Negative declaration.

The Commonwealth of Puerto Rico submitted on April 28, 1981, a letter certifying that there are no existing kraft pulp mills in the Commonwealth subject to Part 60 Subpart B of this chapter.

[46 FR 43834, Sept. 1, 1981]

Subpart CCC—Virgin Islands

Fluoride Emissions From Phosphate Fertilizer Plants

§ 62.13350 Identification of plan—Negative declaration

The Territory Department of Conservation and Cultural Affairs submitted, on November 3, 1977, a letter certifying that there are no existing phosphate fertilizer plants in the Territory subject to Part 60, Subpart B of this Chapter.

[44 FR 41181, July 16, 1979]

Sulfuric Acid Mist Emissions From Sulfuric Acid Plants

§ 62.13351 Identification of plan—Negative declaration.

The Territory Department of Conservation and Cultural Affairs submitted, on November 8, 1977, a letter certifying that there are no existing sulfuric acid plants in the Territory subject to Part 60, Subpart B of this chapter.

[45 FR 37432, June 3, 1980; 46 FR 27342, May 19, 1981]

Total Reduced Sulfur Emissions From Kraft Pulp Mills

§ 62.13352 Identification of plan—Negative declaration.

The Virgin Islands Department of Conservation and Cultural Affairs submitted, on July 31, 1979, a letter certifying that there are no existing kraft pulp mills in the Territory subject to Part 60, Subpart B of this chapter.

[45 FR 80826, Dec. 8, 1980; 46 FR 27342, May 19, 1981]

Fluoride Emissions From Primary Aluminum Reduction Plants

§ 62.13353 Identification of plan—negative declaration.

The Virgin Islands Department of Conservation and Cultural Affairs submitted, on July 21, 1980, a letter certifying that there are no primary aluminum plants in the Territory subject to Part 60, Subpart B of this chapter.

[46 FR 30497, June 9, 1981]

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PART 65—DELAYED COMPLIANCE ORDERS

Subpart A—General Provisions

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65.01 Definitions.
65.02 Introduction.
65.03 Effect of delayed compliance orders.
65.04 Public participation.
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65.06 Effective date of federally promulgated or approved delayed compliance orders and revisions thereto.
65.07 Submittal of State delayed compliance orders to the Administrator.
65.08 Severability of provisions.
65.09 Failure to comply with federally promulgated or approved delayed compliance orders.
65.10 Termination of delayed compliance orders.

Subpart B—Alabama

65.50 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.51 EPA approval of State delayed compliance orders issued to major stationary sources.
65.52 EPA disapproval of State delayed compliance orders.

Subpart C—Alaska

65.60 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.61 EPA approval of State delayed compliance orders issued to major stationary sources.
65.62 EPA disapproval of State delayed compliance orders.

Subpart D—Arizona

65.70 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.71 EPA approval of State delayed compliance orders issued to major stationary sources.
65.72 EPA disapproval of State delayed compliance orders.

Subpart E—Arkansas

65.80 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.81 EPA approval of State delayed compliance orders issued to major stationary sources.
65.82 EPA disapproval of State delayed compliance orders.

Subpart F—California

65.90 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.91 EPA approval of State delayed compliance orders issued to major stationary sources.
65.92 EPA disapproval of State delayed compliance orders.

Subpart G—Colorado

65.100 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.101 EPA approval of State delayed compliance orders issued to major stationary sources.
65.102 EPA disapproval of State delayed compliance orders.

Subpart H—Connecticut

65.110 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.111 EPA approval of State delayed compliance orders issued to major stationary sources.
65.112 EPA disapproval of State delayed compliance orders.

Subpart I—Delaware

65.120 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.121 EPA approval of State delayed compliance orders issued to major stationary sources.
65.122 EPA disapproval of State delayed compliance orders.

Subpart J—District of Columbia

65.130 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.131 EPA approval of State delayed compliance orders issued to major stationary sources.
65.132 EPA disapproval of State delayed compliance orders.

Subpart K—Florida

65.140 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.141 EPA approval of State delayed compliance orders issued to major stationary sources.

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65.142 EPA disapproval of State delayed compliance orders.

Subpart L—Georgia

65.150 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.151 EPA approval of State delayed compliance orders issued to major stationary sources.
65.152 EPA disapproval of State delayed compliance orders.

Subpart M—Hawaii

65.160 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.161 EPA approval of State delayed compliance orders issued to major stationary sources.
65.162 EPA disapproval of State delayed compliance orders.

Subpart N—Idaho

65.170 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.171 EPA approval of State delayed compliance orders issued to major stationary sources.
65.172 EPA disapproval of State delayed compliance orders.

Subpart O—Illinois

65.180 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.181 EPA approval of State delayed compliance orders issued to major stationary sources.
65.182 EPA disapproval of State delayed compliance orders.

Subpart P—Indiana

65.190 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.191 EPA approval of State delayed compliance orders issued to major stationary sources.
65.192 EPA disapproval of State delayed compliance orders.

Subpart Q—Iowa

65.200 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.201 EPA approval of State delayed compliance orders issued to major stationary sources.

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65.202 EPA disapproval of State delayed compliance orders.

Subpart R—Kansas

65.210 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.211 EPA approval of State delayed compliance orders issued to major stationary sources.
65.212 EPA disapproval of State delayed compliance orders.

Subpart S—Kentucky

65.220 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.221 EPA approval of State delayed compliance orders issued to major stationary sources.
65.222 EPA disapproval of State delayed compliance orders.

Subpart T—Louisiana

65.230 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.231 EPA approval of State delayed compliance orders issued to major stationary sources.
65.232 EPA disapproval of State delayed compliance orders.

Subpart U—Maine

65.240 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.241 EPA approval of State delayed compliance orders issued to major stationary sources.
65.242 EPA disapproval of State delayed compliance orders.

Subpart V—Maryland

65.250 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.251 EPA approval of State delayed compliance orders issued to major stationary sources.
65.252 EPA disapproval of State delayed compliance orders.

Subpart W—Massachusetts

65.260 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.261 EPA approval of State delayed compliance orders issued to major stationary sources.

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Sec.
65.262 EPA disapproval of State delayed compliance orders.

Subpart X—Michigan

65.270 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.271 EPA approval of State delayed compliance orders issued to major stationary sources.
65.272 EPA disapproval of State delayed compliance orders.

Subpart Y—Minnesota

65.280 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.281 EPA approval of State delayed compliance orders issued to major stationary sources.
65.282 EPA disapproval of State delayed compliance orders.

Subpart Z—Mississippi

65.290 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.291 EPA approval of State delayed compliance orders issued to major stationary sources.
65.292 EPA disapproval of State delayed compliance orders.

Subpart AA—Missouri

65.300 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.301 EPA approval of State delayed compliance orders issued to major stationary sources.
65.302 EPA disapproval of State delayed compliance orders.

Subpart BB—Montana

65.310 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.311 EPA approval of State delayed compliance orders issued to major stationary sources.
65.312 EPA disapproval of State delayed compliance orders.

Subpart CC—Nebraska

65.320 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.321 EPA approval of State delayed compliance orders issued to major stationary sources.
65.322 EPA disapproval of State delayed compliance orders.

Subpart DD—Nevada

65.330 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.331 EPA approval of State delayed compliance orders issued to major stationary sources.
65.332 EPA disapproval of State delayed compliance orders.

Subpart EE—New Hampshire

65.340 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.341 EPA approval of State delayed compliance orders issued to major stationary sources.
65.342 EPA disapproval of State delayed compliance orders.

Subpart FF—New Jersey

65.350 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.351 EPA approval of State delayed compliance orders issued to major stationary sources.
65.352 EPA disapproval of State delayed compliance orders.

Subpart GG—New Mexico

65.360 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.361 EPA approval of State delayed compliance orders issued to major stationary sources.
65.362 EPA disapproval of State delayed compliance orders.

Subpart HH—New York

65.370 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.371 EPA approval of State delayed compliance orders issued to major stationary sources.
65.372 EPA disapproval of State delayed compliance orders.

Subpart II—North Carolina

65.380 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.381 EPA approval of State delayed compliance orders issued to major stationary sources.

Sec.
65.382 EPA disapproval of State delayed compliance orders.

Subpart JJ—North Dakota

65.390 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.391 EPA approval of State delayed compliance orders issued to major stationary sources.
65.392 EPA disapproval of State delayed compliance orders.

Subpart KK—Ohio

65.400 Federal delayed compliance orders issued under section 113(d) (1), (3) and (4) of the Act.
65.401 EPA approval of State delayed compliance orders issued to major stationary sources.
65.402 EPA disapproval of State delayed compliance orders.

Subpart LL—Oklahoma

65.410 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.411 EPA approval of State delayed compliance orders issued to major stationary sources.
65.412 EPA disapproval of State delayed compliance orders.

Subpart MM—Oregon

65.420 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.421 EPA approval of State delayed compliance orders issued to major stationary sources.
65.422 EPA disapproval of State delayed compliance orders.

Subpart NN—Pennsylvania

65.430 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.431 EPA approval of State delayed compliance orders issued to major stationary sources.
65.432 EPA disapproval of State delayed compliance orders.

Subpart OO—Rhode Island

65.440 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.441 EPA approval of State delayed compliance orders issued to major stationary sources.

Sec.
65.442 EPA disapproval of State delayed compliance orders.

Subpart PP—South Carolina

65.450 Federal delayed compliance orders issued under section 113(d), (1), (3), and (4) of the Act.
65.451 EPA approval of State delayed compliance orders issued to major stationary sources.
65.452 EPA disapproval of State delayed compliance orders.

Subpart QQ—South Dakota

65.460 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.461 EPA approval of State delayed compliance orders issued to major stationary sources.
65.462 EPA disapproval of State delayed compliance orders.

Subpart RR—Tennessee

65.470 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.471 EPA approval of State delayed compliance orders issued to major stationary sources.
65.472 EPA disapproval of State delayed compliance orders.

Subpart SS—Texas

65.480 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.481 EPA approval of State delayed compliance orders issued to major stationary sources.
65.482 EPA disapproval of State delayed compliance orders.

Subpart TT—Utah

65.490 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.491 EPA approval of State delayed compliance orders issued to major stationary sources.
65.492 EPA disapproval of Stated delayed compliance orders.

Subpart UU—Vermont

65.500 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.501 EPA approval of State delayed compliance orders issued to major stationary sources.

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Sec.
65.502 EPA disapproval of State delayed compliance orders.

Subpart VV—Virginia

65.510 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.511 EPA approval of State delayed compliance orders issued to major stationary sources.
65.512 EPA disapproval of State delayed compliance orders.

Subpart WW—Washington

65.520 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.521 EPA approval of State delayed compliance orders issued to major stationary sources.
65.522 EPA disapproval of State delayed compliance orders.

Subpart XX—West Virginia

65.530 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.531 EPA approval of State delayed compliance orders issued to major stationary sources.
65.532 EPA disapproval of State delayed compliance orders.

Subpart YY—Wisconsin

65.540 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.541 EPA approval of State delayed compliance orders issued to major stationary sources.
65.542 EPA disapproval of State delayed compliance orders.

Subpart ZZ—Wyoming

65.550 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.551 EPA approval of State delayed compliance orders issued to major stationary sources.
65.552 EPA disapproval of State delayed compliance orders.

Subpart AAA—Guam

65.560 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.561 EPA approval of State delayed compliance orders issued to major stationary sources.
65.562 EPA disapproval of State delayed compliance orders.

Subpart BBB—Puerto Rico

65.570 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.571 EPA approval of State delayed compliance orders issued to major stationary sources.
65.572 EPA disapproval of State delayed compliance orders.

Subpart CCC—Virgin Islands

65.580 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.581 EPA approval of State delayed compliance orders issued to major stationary sources.
65.582 EPA disapproval of State delayed compliance orders.

Subpart DDD—American Samoa

65.590 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.591 EPA approval of State delayed compliance orders issued to major stationary sources.
65.592 EPA disapproval of State delayed compliance orders.

Subpart EEE—Commonwealth of the Northern Mariana Islands

65.600 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.
65.601 EPA approval of State delayed compliance orders issued to major stationary sources.
65.602 EPA disapproval of State delayed compliance orders.

AUTHORITY: Secs. 113 and 301 of the Clean Air Act, as amended, 42 U.S.C. 7413 and 7601.

SOURCE: 43 FR 44523, Sept. 28, 1978, unless otherwise noted.

Subpart A—General Provisions

§ 65.01 Definitions.

All terms used in this part but not defined herein shall have the meaning given them in the Clean Air Act and in part 51 of this chapter.

(a) "Act" shall mean the Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

(b) "Administrator" shall mean the Administrator of the U.S. Environmental Protection Agency, or his authorized delegatee.

(c) "Regional Administrator" shall mean the Regional Administrator for an EPA regional office whose duties include those set forth at 40 CFR § 1.41, or his authorized delegatee.

(d) "Major stationary source" shall mean any stationary source which directly emits, or has the potential to emit, 100 tons per year or more of any air pollutant for which a national ambient air quality standard under section 109 of the Act is in effect (including any major stationary source of fugitive emissions of any such pollutant, as determined by rule by the Administrator).

(e) "Delayed compliance order" shall mean an order issued by a State or by the Administrator to a stationary source which postpones the date by which the source is required to comply with any requirement contained in the applicable State implementation plan.

(f) The term "Federal delayed compliance order" shall mean a delayed compliance order issued by the Administrator under section 113(d) (1), (3), or (4) of the Act.

(g) The term "State delayed compliance order" shall mean a delayed compliance order issued by a State or by a political subdivision of a State.

(h) "State implementation plan" shall mean the plan, including the most recent revision thereof, which has been approved or promulgated by the Administrator under section 110 of the Act, and which implements the requirements of section 110.

(i) "Stationary source" shall mean any stationary building, facility, equipment, installation, or operation (or combination thereof) which is located on one or more contiguous or adjacent properties and which is owned or operated by the same person (or by persons under common control), and which emits an air pollutant for which a national ambient air quality standard promulgated under section 109 of the Act is in effect.

§ 65.02 Introduction.

(a) Section 113(d) of the Act authorizes the Administrator to issue to certain sources delayed compliance orders permitting a delay in compliance with applicable regulations contained in a State implementation plan. All orders issued by the Administrator under section 113(d) (1), (3), or (4) of the Act will be issued in accordance with the procedures set forth in this part. All such federal delayed compliance orders will be summarized under the subpart corresponding to the State in which the affected source is located.

(b) Section 113(d)(2) of the Act provides that State orders issued to major stationary sources which permit a delay in compliance with applicable State implementation plan regulations must be approved by the Administrator before they have the consequences given delayed compliance orders by section 113(d) of the Act. The Administrator will approve or disapprove, in accordance with the procedures of this part, State delayed compliance orders for major stationary sources which have been submitted to EPA for review under section 113(d)(2) of the Act and § 65.07. All State delayed compliance orders approved or disapproved by the Administrator will be summarized under the subpart corresponding to the State in which the affected source is located.

(c) Section 113(d)(2) of the Act provides that State orders issued to sources other than major stationary sources which permit a delay in compliance with applicable State implementation plan regulations shall cease to be effective as delayed compliance orders under section 113(d) of the Act upon disapproval by the Administrator. The Administrator will promulgate any such disapproval in accordance with the procedures set forth in this part. All such disapprovals will be summarized in the subpart corresponding to the State in which the affected source is located.

(d) The Administrator will issue or approve a delayed compliance order only if it meets all applicable requirements of section 113(d) of the Act.

§ 65.03 Effect of delayed compliance orders

(a) *EPA approved State delayed compliance orders to major stationary*

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sources. A State delayed compliance order issued to a major stationary source, upon approval by the Administrator under section 113(d)(2) of the Act in accordance with this part, shall have the following effects:

(1) The order shall become part of the applicable State implementation plan for the purposes of sections 110, 304, and 307 of the Act; and

(2) The order shall preclude enforcement action against the source under sections 113 and 304 of the Act for violations of the State implementation plan provision(s) covered by the order during the period the order is in effect and the source is complying with the terms of the order.

(b) *State delayed compliance orders to nonmajor stationary sources.* A State delayed compliance order issued to a nonmajor stationary source shall, upon issuance by the State, have the effects specified in paragraph (a) of this section, and will be considered an approved order for the purposes of the part, unless the Administrator disapproves the order under section 113(d)(2) of the Act.

(c) *State delayed compliance orders not approved by EPA.* A State delayed compliance order which has not been approved by the Administrator under this part does not have the effects specified by §§ 65.03(a) and 65.04(e).

(d) *Federal delayed compliance order.* A Federal delayed compliance order issued by the Administrator under section 113(d) (1), (3), or (4) of the Act in accordance with this part precludes enforcement action against the source by EPA under section 113 and by citizens under section 304 of the Act for violations of the State implementation plan provision(s) covered by the order during the period the order is in effect and the source is complying with the terms of the order.

(e) *Source responsibilities and liabilities.* (1) The obligations of a source subject to a delayed compliance order include, but are not limited to:

(i) Compliance with the provisions of the delayed compliance order;

(ii) Compliance with applicable State, local, and Federal requirements not covered by the order;

(iii) Compliance with any requirement imposed pursuant to section 303 of the Act, or pursuant to an emergency plan provision contained in an applicable State implementation plan, during conditions which might create a period of imminent and substantial endangerment to the health of persons.

(2) Compliance with a delayed compliance order promulgated or approved under this part does not preclude enforcement actions initiated under applicable State law for violations of the State implementation plan provisions covered by the order.

§ 65.04 Public participation.

(a) *Federal delayed compliance order.* (1) The appropriate EPA Regional Administrator will provide the public an opportunity to submit written comments and to request a public hearing on any proposed Federal delayed compliance order prior to its issuance. This opportunity and the contents of the proposed Federal order will be published as a notice of proposed rulemaking in the FEDERAL REGISTER. The notice of proposed rulemaking will also provide 30 days notice to the State as required by section 113(d)(1) of the Act, unless notice to the State was given earlier. The public comment period will extend no less than 30 days from the date of the notice.

(2) A period of at least 15 days from publication of the notice described in paragraph (a)(1) of this section will be allowed for receipt of requests for a public hearing. A public hearing will be held if the EPA Regional Administrator determines that there is significant public interest in the hearing. If a hearing is held, it shall take place no less than 21 days following publication of notice in the FEDERAL REGISTER containing, at a minimum, the date, time, place, and subject of the hearing.

(3) If the EPA Regional Administrator anticipates substantial public interest in a hearing on a proposed Federal delayed compliance order, a public hearing will be scheduled by the notice described in paragraph (a)(1) of this section, and will take place no less than 21 days following publication of this notice.

(4) The record of a public hearing will remain open for 10 days after the close of the hearing (or for such other period as set forth in the notice of the hearing). Hearing participants may submit additional information to the record during this time.

(5) Due consideration will be given by EPA to all relevant public comment, whether submitted as written comment or adduced at a hearing, and where appropriate the proposed delayed compliance order will be modified or withdrawn in view of such comments.

(6) If, after the 30 day public comment period and the close of the record of any public hearing on the proposed delayed compliance order, the Administrator determines that the proposed order should be issued, he will promulgate the order in this part, through a FEDERAL REGISTER notice of final rulemaking. If the Administrator determines that a proposed Federal delayed compliance order should not be issued, he will publish a notice in the FEDERAL REGISTER withdrawing the proposal of the order.

(b) *EPA approval or disapproval of a State delayed compliance order.* (1) The Regional Administrator will provide the public with an opportunity to submit written comments on whether EPA should approve a State delayed compliance order for a major stationary source prior to EPA's final approval or disapproval of the order. Notice of the opportunity to comment will be published in the FEDERAL REGISTER. The public comment period will extend for a minimum of 30 days.

(2) The notice described in paragraph (b)(1) of this section will contain, at a minimum, a summary of the contents of the State order under consideration, including the name and location of the source, the State implementation plan regulation(s) covered by the order, a brief summary of the schedule and plan for compliance required by the order, and the date specified for final compliance with the regulation.

(3) Due consideration will be given to all relevant written public comments and, where appropriate, any proposed EPA action on the order will be modified in view of such comments.

(4) Following the public comment period, the Administrator will promulgate in this part through a FEDERAL REGISTER notice of final rulemaking EPA's final approval or disapproval of the State order under consideration.

(5) The procedures specified in this subsection shall apply to the Administrator's disapproval of a delayed compliance order issued by a State to a source other than a major stationary source.

(c) *Revisions of delayed compliance orders.* (1) EPA will follow the procedures specified in § 65.04(a) prior to any revision of a Federal delayed compliance order.

(2) EPA will follow the procedures specified in § 65.04(b) prior to approval of disapproval of any revision submitted by a State or local agency to an EPA approved State delayed compliance order.

(d) *Revocation of delayed compliance orders.* EPA will follow the procedures specified in § 65.04(a) prior to the revocation of a delayed compliance order under section 113(d)(9)(B) of the Act.

(e) *Judicial review.* Publication of the notice of final rulemaking specified in § 65.04(a)(6) and § 65.04(b)(4) will constitute final Agency action for the purposes of judicial review under Section 307(b) of the Act.

§ 65.05 Public access to information.

(a) A copy of a rule proposed under this part, and material supporting the rule, will be available for public inspection during normal business hours at the EPA Regional Office proposing the rulemaking action and at EPA's Public Information Reference Unit at 401 M Street SW., Washington, D.C. 20460. This material will be available beginning with the date notice is published in the FEDERAL REGISTER in accordance with § 65.04 (a)(1) or (b)(1).

(b) The EPA Regional Office will provide reasonable public access during normal business hours to any written comments submitted in response to a notice published under this section and to the record of any public hearing held under § 65.04(a).

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§ 65.06 Effective date of federally promulgated or approved delayed compliance orders and revisions thereto.

(a) Federal delayed compliance orders and revisions to Federal delayed compliance orders promulgated in this part become effective under section 113(d) of the Act upon publication in the FEDERAL REGISTER of the notice described in § 65.04(a)(6).

(b) EPA approval of State delayed compliance orders issued to major stationary sources and revisions to such orders approved under this part become effective under section 113(d) of the Act upon publication in the FEDERAL REGISTER of the notice described in § 65.04(b)(4).

(c) A delayed compliance order issued by a State to a source other than a major stationary source and any revision to such an order becomes effective under section 113(d) of the Act upon final State action, unless the Administrator disapproves the order or revision in accordance with § 65.04(b).

§ 65.07 Submittal of State delayed compliance orders to the Administrator.

In order to obtain EPA approval of a State delayed compliance order under section 113(d)—(2) of the Act, the State shall transmit a copy of the order and a request for EPA action to the appropriate EPA Regional Office, to the attention of the Director, Enforcement Division. In order to obtain EPA approval of a delayed compliance order issued by a local agency, the order must be submitted to EPA by the local agency either through the appropriate State Air Pollution Control Agency or in accordance with procedures established by the State which allow direct submittal of the order to EPA by the local agency. The EPA Regional Offices and addresses are identified at 40 CFR 52.16.

§ 65.08 Severability of provisions.

The provisions promulgated in this part and the various applications thereof are distinct and severable. If any provision of this part or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions, or the application of such provisions to other persons or circumstances, which can be given effect without the invalid provision of application.

§ 65.09 Failure to comply with federally promulgated or approved delayed compliance orders.

(a) If the Administrator determines that a stationary source is in violation of a requirement contained in an order promulgated or approved under this part, he shall, as provided by section 113(d)(9) of the Act: (1) Enforce such requirement under section 113 (a), (b), or (c) of the Act; (2) revoke the order in accordance with §65.04(d) and enforce compliance with the State implementation plan provisions(s) covered by the order; (3) give notice of noncompliance and commence action under section 120 of the Act; or (4) take any appropriate combinations of these actions.

Under section 304 of the Act, and in accordance with 40 CFR Part 54, any person may commence a civil action against an owner or operator of a source which is alleged to be in violation of any order promulgated or approved under this part.

§ 65.10 Termination of delayed compliance orders.

(a) Delayed compliance orders issued or approved by EPA under this part may be terminated if the Administrator determines in accordance with section 113(d)(8) of the Act that the inability of the stationary source to comply with the State implementation plan provision(s) covered by the order no longer exists.

(b) The duration of any provision in a delayed compliance order which is imposed under authority other than section 113(d) of the Act is governed by the terms of that provision.

Subpart B—Alabama

§ 65.50 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the

Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.51 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Alabama Kraft Company	Cottonton, Ala	DCO-78-14	Section 4.8.2	Aug. 10, 1978	July 1, 1979
Champion International Corporation.	Courtland, Ala	DCO-78-21	Section 4.8.2	Oct. 2, 1978	June 30, 1979
Goodyear Tire and Rubber Company (Latex Dip Unit Nos. 2 and 3).	Morgan County, Ala.	DCO-78-20	Section 4.1.1	Oct. 2, 1978	June 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 23833, 23835, Apr. 23, 1979; 44 FR 26742, May 7, 1979.]

§ 65.52 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart C—Alaska

§ 65.60 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.61 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.62 EPA disapproval of state delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart D—Arizona

§ 65.70 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order No.	Date of FEDERAL REGISTER proposal	SIP regulation involved	Final compliance date
Phelps Dodge	Ajo	9-81-27	Oct. 7, 1981	40 CFR 51.125(d), 40 CFR 52.126(b).	Dec. 31, 1985
Phelps Dodge	Morenci	9-81-28	Oct. 7, 1981	40 CFR 51.125(d), Reg. 7-1-3.6 (Arizona State Dept. of Health).	Jan. 1, 1985.

[43 FR 44523, Sept. 28, 1978, as amended at 47 FR 1294, Jan. 12, 1982]

§ 65.71 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.72 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart E—Arkansas

§ 65.80 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.81 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.82 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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Subpart F—California

§ 65.90 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
General Motors Corporation.	Fremont, Calif.	9-79-266	40 CFR 52.254(d).	Dec. 4, 1979	Aug. 31, 1981.
General Motors Corporation.	Fremont, California	9-79-266	40 CFR 52.254(d).	Apr. 6, 1981	Aug. 31, 1981
Guam Power Authority	Agana, Guam	9-80-8	Section 13.4 of Chapter13, Guam Air Pollution Standards and Regulations.	Sept. 9, 1980	Feb. 15, 1985.
Sequoiaboard, Wickes Forest Industries Div. Wickes Corp.	Chowchilla, Calif	Sept. 23, 1977	Madera Co. APCD, Reg. IV, Rules 404, 405, 406.	July 25, 1978	Mar. 15, 1979.
Southern Pacific Pipe Lines, Inc.	Chico, Calif.	9-78-6	40 CFR 52.255	Oct. 27, 1978	June 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 13489, Mar. 12, 1979; 44 FR 16914, Mar. 20, 1979; 45 FR 10342, Feb. 15, 1980; 46 FR 23418, Apr. 27, 1981; 46 FR 43154, Aug. 27, 1981]

§ 65.91 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 123(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.92 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart G—Colorado

§ 65.100 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Eli Lilly and Co	Indianapolis, Ind	EPA-5-79-A-26 EPA-5-79-A-27 EPA-5-79-A-28 EPA-5-79-A-29	APG-15 Section 8	Feb. 9, 1979	Jan. 31, 1979. Jan. 15, 1979. June 1, 1979. June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 25844, May 3, 1979]

§ 65.101 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Public Service Co. of Colorado.	Denver, Colo	A-78-14	Reg. No. 1, Section I.A.1	Oct. 25, 1978	June 15, 1979.
U.S. Army Depot	Pueblo, Colo	A-78-2	Reg. No. 1 Sections I.A.1 and II.A.	May 26, 1978	Feb. 28, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 2388, Jan. 11, 1979; 44 FR 17159, Mar. 21, 1979]

§ 65.102 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart H—Connecticut

§ 65.110 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Pervel Industries, Inc	Plainfield, Conn	A-SS-76-206	19-508-20(f)(4)	Dec. 11, 1979	May 1, 1980.
Veterans Home & Hospital	Rocky Hill, Conn	A-55-78-647	19-508-18(c)(3)	Sept. 11, 1978	Nov. 20, 1978.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 2387, Jan. 11, 1979; 45 FR 14569, Mar. 6, 1980]

§ 65.111 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Leverty and Hurley Company.	Bridgeport, Conn	685	19-508-5(e), 19-508-18(b)(3)(1).	Dec. 28, 1978	May 25, 1979.
New Haven Trap Rock—Tomasso.	Bristol, Conn	697	19-508-5(e)	Jan. 19, 1979	May 15, 1979.
New Haven Trap Rock—Tomasso.	Portland, Conn	698	19-508-5(e)	Jan. 19, 1979	May 15, 1979.
Ross and Roberts, Inc	Norwalk, Conn	707	19-508-18	Feb. 14, 1979	Mar. 15, 1979.

[43 FR 44523 Sept. 28, 1978, as amended at 44 FR 20080, Apr. 4, 1979; 44 FR 27661, May 11, 1979; 44 FR 29683, May 22, 1979; 44 FR 33683, June 12, 1979]

§ 65.112 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart I—Delaware

§ 65.120 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.121 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.122 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart J—District of Columbia

§ 65.130 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.131 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and fundings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.132 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart K—Florida

§ 65.140 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Naval Training Center (pathological waste incinerator).	Orlando, Fla.	DCO-78-3	Chapter 17-2.04(6)(a)2a.	Aug. 10, 1978 (43 FR 35508).	Jan. 15, 1979.
U.S. Naval Station (classified waste incinerator).	Mayport, Fla.	DCO-78-2	Chapter 17-2.04(6)(a)2a.	Aug. 10, 1978 (43 FR 35506).	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 59842, Dec. 22, 1978; 43 FR 60462, Dec. 28, 1978]

§ 65.141 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Florida Steel Corp.	Tampa, Fla.	DCO-78-31	Hillsborough County Chapter 1-3.03 II, Chapter 1-3.03 III, State of Florida Chapter 17-2.04(2) and (3).	Apr. 10, 1979	June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 37507, June 27, 1979]

§ 65.142 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart L—Georgia

§ 65.150 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.151 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of that order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.152 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart M—Hawaii

§ 65.160 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.161 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.162 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart N—Idaho

§ 65.170 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.171 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
FMC Corp	Pocatello, Idaho	I01	Reg. E & F	July 28, 1978	July 1, 1979.
U & I Sugar, Inc	Idaho Falls, Idaho	I02	IDHW Reg. E, G, H & I	Sept. 29, 1978	July 1, 1979

[43 FP. 44523, Sept. 28, 1978, as amended at 43 FR 52704, Nov. 14, 1978; 43 FR 60465, Dec. 28, 1978]

§ 65.172 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart O—Illinois

§ 65.180 Federal delayed compliance orders issued under section 113(d) (1) (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
U.S. Air Force 928th Tactical Airlift Group.	Chicago, Ill.	EPA-5-79-A-13	Rule 203	Sept. 12, 1978	July 1, 1979.
WSC Corporation	Chicago, Ill.	EPA-5-79-A-1	203(d)(6)(B)(i)(bb), 203(d)(6)(B)(iv)(aa).	May 30, 1978	July 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 60464, Dec. 28, 1978; 44 FR 3286, Jan. 16, 1979]

§ 65.181 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.182 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart P—Indiana

§ 65.190 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
American Maize Products Co.	Hammond, Ind	EPA-5-78-A-20.	Indiana APC-19	May 22, 1978	Sept. 21, 1978.
Amoco Oil Company	Whiting, Ind	EPA-5-79-A-23.	APC-15, Section 4.	Feb. 9, 1979	July 1, 1979.
Knauf Fiber Glass GmbH	Shelbyville, Ind	EPA-5-79-A-21.	APC-3 and APC-5.	Oct. 27, 1978	July 1, 1979.
Phillips Petroleum Company.	Clermont, Ind	EPA-5-79-A-33.	APC-15, secs. 3 and 4.	Dec. 19, 1978	July 1, 1979.
Sunmark Industries, a Division of Sun Oil of Pennsylvania.	Clermont, Ind	EPA-5-79-A-22.	APC-15, Section 4.	Dec. 22, 1978	July 1, 1979.
Triangle Refineries	Clermont, Ind	EPA-5-79-A-22.	APC-15, Section 4.	Dec. 27, 1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 52707, Nov. 14, 1978; 44 FR 13487, Mar. 12, 1979; 44 FR 27102, 27105, 27106, May 9, 1979; 44 FR 29455; May 21, 1979]

§ 65.191 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each Order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
American Chemical Services, Inc	Griffith, Ind	None	APC-15	Dec. 13, 1978	Jan. 1, 1979.
Citizens Gas & Coke Utility	Indianapolis, Ind.	INDPLS APC-1	Indiana APC-3, APC-5	Apr. 17, 1978	July 1, 1979.
Guardian Industries Corporation	Huntington, Ind	None	APC-3; APC-5	Sept. 7, 1978	July 1, 1979.
Indiana-Kentucky Electric Corp	Madison, Ohio	None	APC-3; APC-4R.	Feb. 1, 1979	July 1, 1979.
Industrial Fuel and Asphalt Co. of Indiana.	Hammond, Ind	None	APC-15	Aug. 25, 1978	May 15, 1979.
Medora Brick Company	Medora, Ind	None	APC-3	Oct. 26, 1978	June 30, 1979.
Steel Containers, Inc., d.b.a. Calumet Containers.	Hammond, Ind	None	APC-7; APC-16	Sept. 11, 1978	Oct. 30, 1978.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Steel Containers, Inc., d.b.a. Calumet Containers.	Hammond, Ind....	None.....	APC-7; APC-16..	Aug. 18, 1978.....	Dec. 13, 1978.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 44844, Sept. 29, 1978; 44 FR 1732, Jan. 8, 1979; 44 FR 2581, 2584, Jan. 12, 1979; 44 FR 7718, Feb. 7, 1979; 44 FR 13486, Mar. 12, 1979; 44 FR 15493, Mar. 14, 1979; 44 FR 25843, May 3, 1979]

§ 65.192 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Bethlehem Steel Corporation..	Burns Harbor, Ind.....	None.....	APC-3; APC-5....	Mar. 7, 1979.....	July 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 53747, Sept. 17, 1979]

Subpart Q—Iowa

§ 65.200 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Interstate Power Co. Kapp Station.	Clinton, Iowa.....	VII-78-DCO-11.....	Subrule 400—43(2)b.	Sept. 29, 1978....	June 29, 1979.
Iowa State Board of Regents.	University of Iowa, Oakdale Power Plant.	VII-78-DCO-10.....	Subrule 400—4.3(2)b and d.	Sept. 20, 1978....	Jan. 15, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 60161, Dec. 26, 1978; 44 FR 1378, Jan. 5, 1979]

§ 65.201 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Clinton Corn Processing Co.	Clinton, Iowa	VII-78-DCO-8	Subrule 400—4.4(7) I.A.C.	Sept. 1, 1978	July 1, 1979.
Clinton Corn Processing Co.	Clinton, Iowa	VII-78-DCO-9	Subrule 400—4.4(7) I.A.C.	Sept. 1, 1978	Feb. 15, 1979.
Iowa Public Service Co., George Neal Station.	Salix, Iowa	Docket No. VII-78-DCO-4.	Subrule 400—4.3(2) b and d, Iowa Administrative Code.	Aug. 18, 1978	Sept. 26, 1978.
Iowa Public Service	Salix, IA	VII-79-DCO-16	Subrule 400—4.3(2)b.	May 31, 1979	June 30, 1979.
Iowa Valley Milling Co	West Branch, Iowa	VII-78-DCO-14	Subrule 400-4.3(3)b.	Nov. 9, 1976	May 1, 1979.
John Deere Tractor Works	Waterloo, Iowa	Docket No. VII-78-DCO-2.	Subrule 400—4.3(2)b, Iowa Administrative Code.	Aug. 18, 1978	Feb. 10, 1979.
Norris Construction Company.	Ottumwa, Iowa	VII-79-DCO-15	Subrule 400—4.4(2).	June 15, 1979	Jun. 15, 1979.
Northwestern States Portland Cement Company.	Mason City, Iowa	VII-79-DCO-11	Subrule 400—4.3(2)a.	June 15, 1979	July 1, 1979.
Norris Construction Co	Ottumwa, Iowa	VII-78-DCO-20	Subrule 400-4.4(2).	Jan. 4, 1979	Apr. 30, 1979.
Terra Chemicals International.	Sergeant Bluff, Iowa.	VII-79-DCO-1	Subrule 400—4.3(2)a.	Jan. 24, 1979	June 15, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 51782, 51784, Nov. 7, 1978; 43 FR 52242, 52243, Nov. 9, 1978; 44 FR 5430, Jan. 26, 1979; 44 FR 15712, 15713, Mar. 15, 1979; 44 FR 48676, 48677, Aug. 20, 1979]

§ 65.202 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart R—Kansas

§ 65.210 EPA disapproval of State delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Empire District Electric Co	Riverton, Kans	Docket No. VII-78-DCO-6.	KS Regulation 28-19-31C.	Aug. 14, 1978	June 30, 1979.
Phillips Petroleum Company.	Kansas City, Kans	VII-78-DCO-13	28-19-20, 28-19-50.	Oct. 27, 1978	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 56226, Dec. 1, 1978; 44 FR 2584, Jan. 12, 1979]

§ 65.211 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
BPU	Kansas City, Kans	VII-79-DCO-9	Kansas regulation 28-19-31A.	May 31, 1979	July 1, 1979.
Bunge Corporation	Salina, Kans	VII-DCO-78-18	28-19-50A	Dec. 21, 1978	Mar. 1, 1979.
KCPL	LaCygne, Kans	VII-79-DCO-3	28-19-50B	May 29, 1979	July 1, 1979.
Venture Corp	Great Bend, Kans	VII-79-DCO-8	28-19-50A	May 25, 1979	June 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 15709, Mar. 15, 1979; 44 FR 48202, Aug. 17, 1979; 44 FR 48678, 48679, Aug. 20, 1979]

§ 65.212 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart S—Kentucky

§ 65.220 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Owensboro Municipal Utilities	Owensboro, Ky	DCO-78-11	401 KAR 3:060 Section 3(3)e	Sept. 27, 1978	Dec. 31, 1978

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 3287, Jan. 16, 1979]

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§ 65.221 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Berea College	Berea, Ky	DCO-78-7	401 KAR 3:060 Section 3.	Aug. 25, 1978	Mar. 1, 1979.
East KY Power Cooperative.	Ford, Ky	DCO-78-8	401 KAR 3:060 Section 3.	July 31, 1978	July 1, 1979.
Fort Knox	Fort Knox, Ky	DCO-78-26	401 KAR 3:060 Section 3.	Sept. 15, 1978	Mar. 31, 1979.
U.S. Department of Energy	Paducah, Ky	DCO-78-9	401 KAR 3:020 Section 4(8); 401 KAR 3:060 Sections 3(3), 3(4), and 4(3).	Aug. 4, 1978	Mar. 1, 1979.
Western Kentucky University.	Bowling Green, Ky.	DCO-78-10	401 KAR 3:060 Section 3.	July 31, 1978	July 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 59497-59499, Dec. 21, 1978; 44 FR 2582, 2583, Jan. 12, 1979]

§ 65.222 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Airco, Inc	Calvert City, Ky	DCO-78-4	401 KAR 3:060, Sections (4) 3 and 14.	May 30, 1978	July 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 27661, May 11, 1979]

Subpart T—Louisiana

§ 65.230 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.231 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Boise Southern Co	Elizabeth, La	DCO-78-1	§ 23.4(1) LACCR	Dec. 5, 1978	Jan. 1, 1979.
Tenneco Oil Co	Chalmette, La	DCO-79-1	§ 24 LACCR	Jan. 4, 1979	June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 12423, Mar. 7, 1979; 44 FR 51980, Sept. 6, 1979]

§ 65.232 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart U—Maine

§ 65.240 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Great Northern Paper Co	Maine	A-SS-77-473	§ 100.4.2	Aug. 16, 1978	July 1, 1979.
Town of Kennebunkport	Maine	A-SS-77-559	§ 100.2.2	Oct. 2, 1978	Apr. 1, 1979.
Town of Mars Hill	Maine	A-SS-78-649	§ 100.2.2	Nov. 14, 1978	June 15, 1979.
Town of Presque Isle	Maine	A-SS-76-449	§ 100.4.2	July 5, 1978	July 1, 1979.
Town of Camden	Maine	A-SS-77-592	§ 100.2.2	Jan. 26, 1979	July 1, 1979.
Town of Rockport	Maine	A-SS-77-591	§ 100.2.2	Jan. 26, 1979	July 1, 1979.
Town of Washburn	Maine	A-SS-77-560	§ 100.2.2	July 5, 1978	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 47728, Oct. 17, 1978; 43 FR 52031, Nov. 8, 1978; 43 FR 59500, Dec. 21, 1978; 44 FR 5431, Jan. 26, 1979; 44 FR 6097, Jan. 31, 1979; 44 FR 26742, 26743, May 7, 1979]

§ 65.241 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary

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for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.242 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart V—Maryland

§ 65.250 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.251 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Eastalco Aluminum Co	Frederick	10.03.37.02C and D	Oct. 2, 1978	July 1, 1979
General Refractories Company	Baltimore	10.03.38.01A, 10.03.38.03F	Mar. 12, 1979	June 30, 1979
Glidden Pigments Group of SCM Corp.	Baltimore	10.03.38.02A and 10.03.38.03E	Oct. 27, 1978	July 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 13019, Mar. 9, 1979; 44 FR 13482, Mar. 12, 1979; 44 FR 30338, May 25, 1979]

§ 65.252 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part.

With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart W—Massachusetts

§ 65.260 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.261 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.262 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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Subpart X—Michigan

§ 65.270 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.271 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.272 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart Y—Minnesota

§ 65.280 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.281 EPA approval of State delayed compliance orders issued to major stationary sources.

The State Orders identified below have been approved by the Administrator in accordance with Section 113(d)(2) of the Act and with this part. With regard to each Order, the Administrator has made all the determinations and findings which are necessary for approval of the Order under Section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Metroplant wastewater treatment plant	St. Paul, Minn		APC-7(b)(1)(cc), APC-7(b)(2), APC-11(b).	Feb. 6, 1979	July 1, 1979
National Can Corporation	St. Paul, Minn		APC-1(c)(4)	Dec. 7, 1978	May 1, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 15714, Mar. 15, 1979; 44 FR 29456, May 21, 1979]

§ 65.282 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart Z—Mississippi

§ 65.290 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.291 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.292 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart AA—Missouri

§ 65.300 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
City of Independence Power & Light Department	Independence, Mo	VII-78-DCO-17	Regulation III (10 C.S.R. 10-2.040)	Dec. 6, 1978	June 30, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 6912, Feb. 5, 1979]

§ 65.301 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Mississippi Lime Co	Ste. Genevieve, Mo	VII-78-DCO-19	Regulation S-V (10 C.S.R. 10-3.050)	Jan. 8, 1979	Feb. 28, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 15710, Mar. 15, 1979]

§ 65.302 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart BB—Montana

§ 65.310 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.311 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.312 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart CC—Nebraska

§ 65.320 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.321 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
City of Fremont	Fremont, Nebr	VII-79-DCO-2	6 and 13	Mar. 7, 1979	June 15, 1979
Nebraska Asphalt Paving Company	Valley, Nebr	VII-78-DCO-15	Nebraska Rules 5 and 13	Nov. 21, 1978	June 15, 1979

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 7715, Feb. 7, 1979; 44 FR 31180, May 31, 1979]

§ 65.322 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart DD—Nevada

§ 65.330 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.331 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.332 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart EE—New Hampshire

§ 65.340 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.341 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.342 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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Subpart FF—New Jersey

§ 65.350 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Agway Petroleum Corp	Mt. Holly, Chester, Freehold, and Hightstown, N.J.	80170	40 CFR §§ 52.1595 and 52.1598	Aug. 1, 1978	Sept. 1, 1978.
Andrews Oil Co	Salem, N.J.	80169	40 CFR §§ 52.1595 and 52.1598	do	Oct. 1, 1978.
Globe Petroleum	Red Bank, N.J.	80167	40 CFR §§ 52.1595 and 52.1598	do	Sept. 1, 1978.
Mannington Mills, Inc	Salem, N.J.	70117	N.J.A.C. 7:27-6.2	May 8, 1979 (44 FR 26936).	June 30, 1979.
Moore Bros. Oil Co	Mahwah, N.J.	80165	40 CFR §§ 52.1595 and 52.1598	do	Sept. 1, 1978.
N.L. Industries, Inc	Sayreville, N.J.	90113	N.J.A.C. 7:27-6.2	Apr. 31, 1980	May 31, 1980.
Taylor Oil Co., Inc	Somerville, N.J.	80166	40 CFR §§ 52.1595 and 52.1598	Aug. 1, 1978	Oct. 1, 1978.

[43 FR 44523, Sept. 28, 1978, as amended at 43 FR 54627, Nov. 22, 1978; 44 FR 41782, July 18, 1979; 45 FR 46386, July 10, 1980]

§ 65.351 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.352 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart GG—New Mexico

§ 65.360 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.361 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Public Service Company of New Mexico	San Juan County, N. Mex	00432-021	NM 602.B	Apr. 14, 1980	Apr. 18, 1980.

[43 FR 44523, Sept. 28, 1978, as amended at 45 FR 73046, Nov. 4, 1980]

§ 65.362 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Public Service Company of New Mexico	San Juan County, N. Mex	00432-021	NM 504.C	Apr. 14, 1980	Apr. 18, 1980.

[43 FR 44523, Sept. 28, 1978, as amended at 45 FR 73046, Nov. 4, 1980]

Subpart HH—New York

§ 65.370 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.371 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.372 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart II—North Carolina

§ 65.380 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Collins and Aikman Corp.	Albermarle, N.C.	DGO-78-33	15 NCAC, 2D.0503, .0504, .0521.	Feb. 9, 1979	June 1, 1980

[43 FR 44523,; Sept. 28, 1978, as amended at 44 FR 35225, June 19, 1979]

§ 65.381 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Camp Lejeune Marine Corps Base	Camp Lejeune, N.C.	DCO-78-47	.0503, .0521	Jan. 17, 1979	June 30, 1979.
Duke Power Co., Belews Creek Steam Station Unit 2.	Walnut Cove, N.C.	DCO-78-54	.0503, .0521	Jan. 23, 1979	July 1, 1979.
E. J. Snyder and Co., Inc.	Albemarle, N.C.	DCO-78-46	.0521	Jan. 17, 1979	Apr. 1, 1979.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Westvaco Corporation	North Charleston, S.C.	DCO-78-40	62.6, Standard No. 5, Section II.	Jan. 31, 1979	June 15, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 23830, 23831, 23834, Apr. 23, 1979]

§ 65.382 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Carolina Power and Light Co., Roxboro Unit 3.	Roxboro, Person County, N.C.	DCO-78-43	15 NCAC 2D .0503 and .0521.	May 14,1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 54027, Sept. 18, 1979]

Subpart JJ—North Dakota

§ 65.390 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.391 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
U.S. Noonlite Ltd.	Mandan, N. Dak.	A-79-1	Sec. 33-15-03-01 and 33-15-05-01.	May 31, 1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 68830, Nov. 30, 1979]

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BEST DOCUMENT AVAILABLE

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§ 65.392 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart KK—Ohio

§ 65.400 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
American Can Co	Cleveland, Ohio	EPA-5-80-A-9	AD-5-07(G)(1)	Nov. 20, 1979	Dec. 31, 1979.
Amoco Oil Co	Aurora, Ohio	EPA-5-79-A-49	AP-5-07(E)	June 15, 1979	July 1, 1979.
The Andersons	Toledo, Ohio	EPA-5-81-A(d)-11.	July 17, 1981	AP-3-07, AP-3-08, AP-3-12.	April 15, 1982.
Apple Creek State Institute	Apple Creek, Ohio.	EPA-5-78-A-9	AP-3-11	Apr. 17, 1978	June 1, 1978.
Athens Mental Health Center	Athens, Ohio	EPA-5-78-A-10	AP-3-11	...do	July 1, 1979.
Bowling Green University	Bowling Green, Ohio.	EPA-5-79-A-6	AP-3-11	Sept. 5, 1978	July 1, 1979.
Buckeye Power, Inc., Cardinal Generating Station.	Brilliant, Ohio	EPA-5-79-A-14	AP-3-07, AP-3-11	Oct. 23, 1978	Apr. 15, 1980.
Cambridge Mental Health and Mental Retardation Center.	Cambridge, Ohio	EPA-5-78-A-11	AP-3-11	Apr. 17, 1978	July 1, 1979.
Campbell Soup Co	Napoleon, Ohio	EPA-5-78-A-23	AP-3-07, AP-3-11	July 17, 1978	July 1, 1979.
Central Ohio Psychiatric Hospital.	Columbus, Ohio	EPA-5-78-A-19	AP-3-11	Apr. 17, 1978	July 1, 1979.
Chase Bag Co	Chagrin Falls, Ohio.	EPA-5-79-A-35	AP-3-11	Jan. 26, 1979	July 1, 1979.
City of Orrville Municipal Power Plant.	Orrville, Ohio	EPA-5-79-A-2	OAC 3745-17-10	May 31, 1978	July 1, 1979.
City of Cleveland	Cleveland, Ohio	EPA-5-78-A-8	AP-3-11 and 40 CFR § 52.1881 et seq.	May 31, 1978	July 1, 1979.
Cleveland Electric Illuminating Company	Eastlake, Ohio Ashtabula, Ohio Avon Lake, Ohio Cleveland, Ohio.	EPA-5-79-A-9 EPA-5-79-A-10 EPA-5-79-A-11 EPA-5-79-A-12	AP-3-11 AP-3-07	Aug. 14, 1978	Apr. 15, 1980.
Columbus Products Co., a Division of White Consolidated Industries, Inc.	Columbus, Ohio	EPA-5-80-A-1	OAC-3745-17-10	Aug. 10, 1979	Apr. 15, 1980.
Columbus State Institute	Columbus, Ohio	EPA-5-78-A-12	AP-3-11	Apr. 17, 1978	July 1, 1979.
Cooper Tire & Rubber Co	Findlay, Ohio	None	OAC 3745-17-07	June 19, 1979	July 30, 1979
Defense Logistics Agency; Defense Construction Supply Center.	Columbus, Ohio	EPA-5-79-A-7	AP-3-11	Sept. 8, 1978	Mar. 31, 1979.
Defense Logistics Agency; Defense Electronics Supply Center.	Dayton, Ohio	EPA-5-79-A-3	OAC 3745-17-10	Sept. 8, 1978	Mar. 30, 1979.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Defense Logistics Agency, Defense Electronics Supply Center.	Dayton, Ohio	EPA-5-79-A-41	40 CFR 52.1881(b)(46)(vii).	Feb. 1, 1979	June 30, 1979.
Department of the Air Force.	Wright-Patterson Air Force Base, Ohio.	EPA-5-79-A-43	AP-3-11	May 8, 1979	Apr. 15, 1980.
Department of Energy:					
Feed Materials Production Center.	Fernald, Ohio	EPA-5-79-A-18	AP-3-11	Sept. 8, 1978	Feb. 15, 1979.
Portsmouth Area Gaseous Diffusion Plant.	Piketon, Ohio	EPA-5-79-A-17	AP-3-11	Sept. 8, 1978	May 1, 1979.
Dover Municipal Power Plant.	Dover, Ohio	EPA-5-79-A-47	AP-3-07 AP-3-11	May 15, 1979	Aug. 10, 1979.
Factory Power Co	Cincinnati, Ohio	EPA-5-79-A-42	AP-3-11	May 8, 1979	Mar. 30, 1980.
Gallipolis State Institute	Gallipolis, Ohio	EPA-5-78-A-13	AP-3-11	Apr. 17, 1978	July 1, 1979.
General Motors Corp.:					
Fisher Body Division	Columbus, Ohio	EPA-5-80-A-3	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
Fisher Body Division	Elyria, Ohio	EPA-5-80-A-4	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
Fisher Body Division	Hamilton, Ohio	EPA-5-80-A-5	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
Fisher Body Division	Mansfield, Ohio	EPA-5-80-A-6	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
GM Assembly Division	Norwood, Ohio	EPA-5-79-A-19	AP-3-11	Dec. 11, 1978	July 11, 1979.
New Departure Hyatt Bearings Division.	Sandusky, Ohio	EPA-5-80-A-7	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
Packard Electric Division.	Warren, Ohio	EPA-5-80-A-8	AP-3-11, AP-3-07	Sept. 26, 1979	July 1, 1981.
Indiana Farm Bureau Cooperative Association, Inc.	Westfield, Ind	EPA-5-79-A-25	APC-15 sections 3 and 4.	Dec. 6, 1978	July 1, 1979.
Interlake, Inc	Toledo, Ohio	EPA-5-78-A-24	AP-3-07	June 28, 1978	July 1, 1979.
Kaiser Aluminum and Chemical Corporation.	Heath, Ohio	EPA-5-79-A-16	AP-3-11	Oct. 23,1978	Mar. 31, 1979.
Koppers Co., Inc.	Youngstown, Ohio.	EPA-5-79-A-48	AP-3-07, AP-3-11, 40 CFR 52.1882(b).	Oct. 31, 1979	Jan. 15, 1980.
Lawrence Refractories	Pedro, Ohio	EPA-5-79-A-24	AP-3-12	May 31, 1978	Apr. 1, 1979.
Massillon State Hospital	Massillon, Ohio	EPA-5-78-A-14	AP-3-11	June 8, 1978	July 1, 1979.
Mt. Vernon State Institute	Mt. Vernon, Ohio	EPA-5-78-A-15	AP-3-11	Apr. 17, 1978	May 1, 1978.
Muskingum River Generating Station.	Beverly, Ohio	EPA-5-79-A-31	AP-3-07, AP-3-11	Dec. 21, 1978	Apr. 15, 1980.
Ohio Ferro-Alloys Corp.	Powhatan Point, Ohio	EPA-5-79-A-44	AP-3-07, AP-3-12	June 19, 1979	Jan. 15, 1980.
Ohio Power Co., Cardinal Generating Station.	Brilliant, Ohio	EPA-5-79-A-30	AP-3-07, AP-3-11	Dec. 21, 1978	Apr. 15, 1980.
Ohio University	Athens, Ohio	EPA-5-78-A-19	Ohio, AP-3-11	June 28, 1978	July 1, 1979.
Ohio Valley Electric Corp., Kyger Creek Plant.	Gallipolis, Ohio	EPA-5-79-A-34	AP-3-07, AP-3-11	Nov. 21, 1978	Apr. 15, 1980.
Orient State Institute	Orient, Ohio	EPA-5-78-A-16	AP-3-11	Apr. 17, 1978	July 1, 1979.
PPG Industries No. 12 Boiler	Barbertón, Ohio	EPA-5-78-A-25	AP-3-07	June 27, 1978	July 1, 1979.
Sun Oil Co., of Pennsylvania.	Columbus	EPA-5-79-A-36	AP-5-07	Jan. 25, 1979	July 1, 1979.
	Cleveland	EPA-5-79-A-37	AP-5-07	Jan. 25, 1979	July 1, 1979.
	Akron	EPA-5-79-A-38	AP-5-07	Jan. 25, 1979	July 1, 1979.
	Dayton	EPA-5-79-A-39	AP-5-07	Jan. 25, 1979	July 1, 1979.
	Toledo	EPA-5-79-A-40	AP-5-07	Jan. 25, 1979	July 1, 1979.
Tiffin Mental Health and Mental Retardation Center.	Tiffin, Ohio	EPA-5-78-A-17	AP-3-11	Apr. 17, 1978	May 1, 1979.
Toledo Edison Company, Acme Station.	Toledo, Ohio	EPA-5-79-A-4	AP-3-07, AP-3-11	Oct. 2, 1978	Apr. 15, 1980.
Toledo Edison Company, Bay Shore Station.	Oregon, Ohio	EPA-5-79-A-5	AP-3-07, AP-3-11	Oct. 2, 1978	Apr. 15, 1980.
Toledo Mental Health Center.	Toledo, Ohio	EPA-5-78-A-18	AP-3-11	Apr. 17, 1978	July 1, 1979.

[43 FR 40015, Sept. 11, 1978]

NOTE: For Federal Register citations affecting § 65.400, see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

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§ 65.401 EPA approval of State delayed compliance orders issued to major stationary sources.

The State Orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this Part. With regard to each Order, the Administrator has made all the determinations and findings which are necessary for approval of the Order under Section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
American Materials Corporation	Middleton, Ohio	None	OAC 3745-17-07, OAC 3745-17-11.	Feb. 20, 1979	July 1, 1979.
Austin Powder Company	McArthur, Ohio	None	OAC-3745-17-10	Feb. 16, 1979	July 1, 1979.
B. F. Goodrich Co	Akron, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	June 19, 1979	July 1, 1979.
Blanchester Foundry Company.	Blanchester, Ohio	None	OAC-3745-17-07, OAC-3745-17-11.	Jan. 23, 1979	July 1, 1979.
Buckeye Steel Casting	Columbus, Ohio	None	OAC-3745-17-07, OAC-3745-17-11.	Feb. 16, 1979	July 1, 1979.
Buckeye Sugars, Inc	Ottawa, Ohio	None	OAC 3745-17-10, OAC 3745-17-07.	Dec. 7, 1978	July 1, 1979
Capitol University	Columbus, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	May 8, 1980	July 1, 1979.
Central Soya Co., Inc	Marion, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	May 8, 1979	Apr. 15, 1980.
Chrysler Casting Corp., Fostoria Foundry Division	Fostoria, Ohio	None	OAC 3745-17-11 (B)(5).	Sept. 25, 1978	June 30, 1979.
City of Akron	Akron, Ohio	None	OAC 3745-17-07, OAC 3745-17-09.	Aug. 25, 1978	July 1, 1979.
Corning Glass Works	Greenville, Ohio	None	OAC 3745-17-07(a)(1).	Nov. 21, 1978	July 1, 1979.
Dayton Mental Health Center.	Dayton, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	Aug. 25, 1978	June 1, 1979.
Dayton Power and Light Co.	Dayton, Ohio	None	OAC-3745-17-07, OAC-3745-17-10.	Feb. 20, 1979	June 30, 1979.
Diamond Crystal Salt Co	Akron, Ohio	None	OAC 3745-17-07, OAC 3745-17-11.	June 22, 1979	July 1, 1979.
Ford Motor Co. Canton Forge Plant	Canton, Ohio	None	OAC 3745-17-07, OAC 3745-17-11.	May 25, 1979	July 1, 1979.
Formica Corp	Evendale, Ohio	None	OAC-3745-17-10	Feb. 1, 1979	July 1, 1979.
Fox Paper, Inc	Lockland, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	June 19, 1979	July 1, 1979.
General Housewares Corp., Wagner Manufacturing Division.	Sidney, Ohio	None	OAC 3745-17-07, OAC 3745-17-11.	May 1, 1979	July 1, 1979.
General Motors Corp., Delco Products Division.	Kettering, Ohio	None	OAC-3745-17-07, OAC-3745-17-10.	Jan. 23, 1979	Jan. 1, 1979.
Gold Bond Building Products.	Newark, Ohio	None	OAC 3745-17-07, OAC 3745-17-11.	Aug. 18, 1978	June 30, 1978.
Great Lakes Carbon Corp	Marion, Ohio	None	OAC-3745-17-07, OAC-3745-17-11.	Feb. 16, 1979	Nov. 1, 1979.
Indiana Gas & Chemical Corp	Terre Haute, Ind	None	Vigo County Regulation 405.	Nov. 21, 1978	July 1, 1979.
Lima State Hospital	Lima, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	Aug. 25, 1978	June 1, 1978.
Lincoln Electric Co	Cleveland, Ohio	None	OAC 3745-21-07(G).	May 8, 1979	July 1, 1979.
Miami County Incinerator	Troy, Ohio	None	OAC 3745-17-09, OAC 3745-17-17.	Dec. 21, 1978	Dec. 31, 1978.
Miami University	Oxford, Ohio	None	OAC 3745-17-07, OAC 3745-17-10.	Aug. 25, 1978	May 15, 1979.
Ohio Department of Mental Health and Mental Retardation, Longview State Hospital	Cincinnati, Ohio	None	OAC 3745-17-10	Sept. 27, 1978	July 1, 1979.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Ohio Match Co	Wadsworth, Ohio	None	OAC-3745-17-07(A), OAC-3745-17-10(B)		July 1, 1979
Power Plant	St. Marys, Ohio	None	OAC 3745-17-07, OAC 3745-17-10	June 6, 1979	Dec. 31, 1979
Sorg Paper Co	Middletown, Ohio	None	OAC-3745-17-07, OAC-3745-17-10	Feb. 1, 1979	July 1, 1979
Steel Abrasives, Inc	Fairfield, Ohio	None	OAC 3745-17-07, OAC 3745-17-11	June 5, 1979	July 1, 1979

[43 FR 44528, Sept. 28, 1978]

NOTE: For Federal Register citations affecting § 65.401, see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

§ 65.402 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Dayton Press, Inc	Dayton, Ohio	None	OAC 3745-17-07, OAC 7745-21-07	Apr. 6, 1979	May 31, 1980

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 61962, Oct. 29, 1979]

Subpart LL—Oklahoma

§ 65.410 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.411 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.412 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart MM—Oregon

§ 65.420 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.421 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.422 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart NN—Pennsylvania

§ 65.430 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.431 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Pennsylvania Power & Light Co., Montour Units 1 and 2.	Derry Township, Pa		Section 123.11 of title 25.	June 13, 1979	July 1, 1979.

[43 FR 44523, Feb. 15, 1978, as amended at 45 FR 10341, Feb. 15, 1980]

§ 65.432 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Bethlehem Steel Corp.—Bethlehem Plant.	Bethlehem, Pa	None	25 PA Code §§ 123.1, 123.41.	July 30, 1979	None.

[43 FR 44523, Feb. 15, 1978, as amended at 44 FR 56697, Oct. 2, 1979; 45 FR 45278, July 3, 1980]

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Subpart OO—Rhode Island

§ 65.440 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.441 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.442 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart PP—South Carolina

§ 65.450 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.451 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
U.S. Dept. of Energy, Savannah River Operations Office	North Charleston, S.C.	DCO-78-40	R61-62.5, Standard No. 1, Secs. I, II.	Sept. 20, 1979	July 1, 1979.
Westvaco Corp	Aiken, S.C.	DCO-79-9	62.6, Standard No. 5, Section II.	Jan. 31, 1979	June 15, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 23832, Apr. 23, 1979; 45 FR 3035, Jan. 16, 1980]

§ 65.452 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart QQ—South Dakota

§ 65.460 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.461 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.462 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart RR—Tennessee

§ 65.470 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.471 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Knoxville Iron Co	Knoxville, Tenn	DCO-78-34	§§ 17.0, 19.0, and 22.0 Knox County Air Pollution Control Regs.	Dec. 5, 1978	May 1, 1979.
Tamko Asphalt Products Company.	Knoxville, Tenn	DCO-78-28	§§ 17.0, and 41.0	Nov. 28, 1978	June 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 20081, Apr. 4, 1979; 44 FR 23833, Apr. 23, 1979]

§ 65.472 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart SS—Texas

§ 65.480 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
A P Green Refractories Co	Freeport, Tex	DCO-TX-79-1	TACB Reg. I, Rule 105.1 and 103.1.	June 7, 1979	June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 52207, Sept. 7, 1979]

§ 65.481 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.482 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart TT—Utah

§ 65.490 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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§ 65.491 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Kaibab Industries	Panguitch, Utah	A-79-19	Section 2.2.1	June 29, 1979	July 1, 1979.
Spanish Fork Foundry	Spanish Fork, Utah	A-79-4	Section 2.2.1	Mar. 21, 1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 32683, June 7, 1979; 44 FR 63103, Nov. 2, 1979]

§ 65.492 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart UU—Vermont

§ 65.500 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.501 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.502 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart VV—Virginia

§ 65.510 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.511 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Dan River inc	Danville, Va	None	4.20 and 4.30	Feb. 2, 1979	July 1, 1979.
Jewell Coal & Coke Co	Vansant, Va	None	4.20 and 4.40	Oct. 13, 1978	June 30, 1979.
Plant No. 1	Vansant, Va	None	4.20 and 4.40	Apr. 27, 1979	June 30, 1979.
Solite Corp	Cascade, Va	None	4.20 and 4.40	Feb. 2, 1979	Mar. 31, 1979.
U.S. General Services Administration	Arlington, Va	None	4.02.01 and 4.03.01	Oct. 29, 1978	June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 13483, 13484, Mar. 12, 1979; 44 FR 47061, 47062, Aug. 10, 1979]

§ 65.512 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

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Subpart WW—Washington

§ 65.520 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.521 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Fletcher Oil Co	Tacoma, Washington.	W13	WAC 173-490-040, WAC 173-490-201, PSAPCA Reg. II.	Feb. 12, 1982	Jan. 1, 1983.
Georgia-Pacific	Bellingham, Wash	WO1	WAC 18-04-070(3)	Dec. 14, 1977	June 3, 1979.
Kaiser Aluminum & Chemical Corp.	Mead, Wash	WO3	WAC 18-52-031	Aug. 23, 1978	July 1, 1979.
Lone Star Industries Inc	Seattle, Wash	W11	Sec. 9.15, Reg. I, PSAPCA.	Feb. 13, 1979	July 1, 1979.
Louisiana Pacific Corp	Ione, Wash	W12	WAC 18-04-040	Mar. 28, 1979	July 1, 1979.
Matney Lumber Co	Kettle Falls, Wash	WO8	WAC 18-04-040	Jan. 5, 1979	July 1, 1979.
Scott Paper Co	Everett, Wash	WO2	WAC 18-04-070, PSAPCA Reg. I.	Mar. 9, 1978	July 1, 1979.
Seattle Steam Corp	Seattle, Wash	WO5	PSAPCA Reg. I, Sec. 9.03(b)(1).	Nov. 14, 1978	July 1, 1979.
Suntex Veneer	Spokane, Wash	WO4	WAC-18-040	Nov. 13, 1978	July 1, 1979.
Vaagen Brothers Lumber Co.	Colville, Wash	W10	WAC 18-04-040	Jan. 5, 1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978]

NOTE: For Federal Register citations affecting § 65.521, see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

§ 65.522 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart XX—West Virginia

§ 65.530 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Federal Correctional Institution.	Alderson, W. Va	III 78-1-DCO	Regulation II	May 31, 1979	June 30, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 61183, Oct. 24, 1979]

§ 65.531 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Banner Fibreboard Co	Wellsburg, W. Va	None	Regulation II	Sept. 25, 1978	July 1, 1978.
Brockway Glass Co. Inc	Vienna, W. Va	None	Regulation VII	Sept. 25, 1978	Dec. 30, 1978.
Central Operating Co.—Phillip Sporn Plant.	New Haven, W. Va	None	Regulation II	Oct. 2, 1978	July 1, 1979.
Consolidation Coal Co	Harrison County, W. Va.	None	Regulation V	Aug. 16, 1979	June 30, 1979.
Koppers Co., Inc	Follansbee, W. Va	None	Regulation II	Sept. 25, 1978	Mar. 31, 1979.
National Steel Corp.; Weirton Steel Division Sinter Plant.	Weirton, W. Va	None	Regulation VII	July 1, 1979	July 1, 1979.
Pennsylvania Glass Sand Corp.	Berkeley Springs, W. Va.	None	Regulation II	Sept. 25, 1978	June 30, 1979.
Pennzoil Co	Falling Rock, W. Va	None	Regulation VII	Sept. 25, 1979	Nov. 5, 1978.
Triangle PWC, Inc	Glen Dale, W. Va	None	Regulation II	Sept. 25, 1978	July 1, 1979.
Union Carbide, Corp	South Charleston, W. Va.	None	Regulation II	Aug. 25, 1978	July 1, 1979.

[43 FR 44523, Sept. 28, 1978]

NOTE: For Federal Register citations affecting § 65.531, see the List of CFR Sections Affected appearing in the Finding Aids section of this volume.

§ 65.532 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
National Steel Corp.:					
Weirton Steel Division Mainland Coke Plant.	Weirton, W. Va.	None	Regulation VII	Jan. 4, 1979	July 1, 1979.
Weirton Steel Division Mainland Coke Plant, Coke Oven Gas Desulfurization.	Weirton, W. Va.	None	Regulation X	Jan. 4, 1979	June 30, 1980.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 41779, 41781, July 18, 1979]

Subpart YY—Wisconsin

§ 65.540 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.541 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.542 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart ZZ—Wyoming

§ 65.550 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.551 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
CF & I STEEL Corp, Sunrise Mine	Sunrise, Wyo	A-79-8	Sec. 14(g)	May 7, 1979	July 1, 1979.
FMC Corp	Kemmerer, Wyo	A-79-6	Sec. 14(b) and 14(g).	Apr. 16, 1979	July 1, 1979.
U.S. Steel, Western Ore Operation.	Near Atlantic City, Wyo.	A-79-9	Sec. 14(g)	May 7, 1979	July 1, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 68832, 68833, Nov. 30, 1979]

§ 65.552 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Black Hills Power & Light Co	East of Gillette, Wyo.	A-79-7	Sec. 14(b) and 14(h)		Apr. 16, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 FR 68831, Nov. 30, 1979]

Subpart AAA—Guam

§ 65.560 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
Andersen Air Force Base	Guam	9-77-40	Nov. 21, 1978	Guam Chapters 8 & 10.	June 15, 1979.

[43 FR 44523, Sept. 28, 1978, as amended at 44 8264, Feb. 9, 1979]

§ 65.561 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.562 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart BBB—Puerto Rico

§ 65.570 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.571 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.572 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart CCC—Virgin Islands

§ 65.580 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.581 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.582 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

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Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart DDD—American Samoa

§ 65.590 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.591 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.592 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

Subpart EEE—Commonwealth of the Northern Mariana Islands

§ 65.600 Federal delayed compliance orders issued under section 113(d) (1), (3), and (4) of the Act.

The delayed compliance orders referenced below have been issued by the Administrator in accordance with section 113(d) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for issuance of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.601 EPA approval of State delayed compliance orders issued to major stationary sources.

The State orders identified below have been approved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has made all the determinations and findings which are necessary for approval of the order under section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

§ 65.602 EPA disapproval of State delayed compliance orders.

The State orders identified below have been disapproved by the Administrator in accordance with section 113(d)(2) of the Act and with this part. With regard to each order, the Administrator has determined that it does not satisfy the applicable requirements of section 113(d) of the Act.

Source	Location	Order Number	SIP regulation(s) involved	Date of FEDERAL REGISTER proposal	Final compliance date
[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]	[Reserved]

PART 66—ASSESSMENT AND COLLECTION OF NONCOMPLIANCE PENALTIES BY EPA

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APPENDIX A—TECHNICAL SUPPORT DOCUMENT [NOTE]
APPENDIX B—INSTRUCTION MANUAL [NOTE]
APPENDIX C—COMPUTER PROGRAM [NOTE]

AUTHORITY: Sec. 120, Clean Air Act, as amended, 42 U.S.C. 7420.

SOURCE: 45 FR 50110, July 28, 1980, unless otherwise noted.

Subpart A—Purpose and Scope

§ 66.1 Applicability and effective date.

(a) This part applies to all proceedings for the assessment by EPA of a noncompliance penalty as provided by Section 120 of the Clean Air Act. This penalty is designed to recover the economic advantage which might otherwise accrue to a source by reason of its failure to comply with air pollution control standards after receipt of a notice of noncompliance.

(b) These regulations shall be effective October 27, 1980.

§ 66.2 Program description.

This part sets forth the procedures by which EPA will administer the noncompliance penalty provisions of Section 120 of the Clean Air Act. Subpart A describes the scope of the part, defines key terms and states the manner of operation of these provisions Subpart B states which sources of air pollution are subject to these penalties and the form and substance of the notice of noncompliance. Subpart C and the accompanying Technical Support Document and Manual state how a source must compute the penalty which it owes. Subpart D describes the conditions under which an exemption from the penalty may be available, and Subpart E sets forth the procedures for requesting such an exemption. Subpart F states how EPA will review penalties calculated by sources under Subpart C, and Subpart G describes the method of payment. Subpart H provides for adjustment of the penalty after the source has come into compliance and the actual costs of doing so are known. Finally, Subpart I states which actions under these regulations are subject to judicial review and on what conditions, and Subpart J provides supplemental procedures for adjudicatory hearings.

§ 66.3 Definitions.

In this Part and Part 67:

(a) "Act" means the Clean Air Act, 42 U.S.C. 7401 *et seq.* as amended on August 7, 1977, except where the context specifically indicates otherwise.

(b) "Affiliated entity" means a person who directly, or indirectly through one or more intermediaries, controls, is controlled by, or is under common control with the owner or operator of a source.

(c) "Applicable legal requirements" means any of the following:

(1) In the case of any major source, any emission limitation, emission standard, or compliance schedule under any EPA-approved State implementation plan (regardless of whether the source is subject to a Federal or State consent decree);

(2) In the case of any source, an emission limitation, emission standard, standard of performance, or other requirement (including, but not limited to, work practice standards) established under Section 111 or 112 of the Act;

(3) In the case of a source that is subject to a federal or federally approved state judicial consent decree or EPA approved extension, order, or suspension, any interim emission control requirement or schedule of compliance

under that consent decree, extension, order or suspension;

(4) In the case of a nonferrous smelter which has received a primary nonferrous smelter order issued or approved by EPA under Section 119 of the Act, any interim emission control requirement (including a requirement relating to the use of supplemental or intermittent controls) or schedule of compliance under that order.

(d) "Approved Section 120 program" means a State program to assess and collect Section 120 penalties that has been approved by the Administrator.

(e) "Computer program" means the computer program used to calculate noncompliance penalties under Section 120 of the Clean Air Act. This computer program appears as Appendix C to these regulations.

(f) "Control" (including the terms "controlling", "controlled by", and "under common control with") means the power to direct or cause the direction of the management and policies of a person or organization, whether by the ownership of stock, voting rights, by contract, or otherwise.

(g) "Major stationary source" means any stationary facility or source of air pollutants which directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant regulated by EPA under the Clean Air Act.

(h) "Manual" means the "Noncompliance Penalties Instruction Manual" which accompanies these regulations. This Manual appears as Appendix B to these regulations.

(i) "Owner or operator" means any person who owns, leases, operates or supervises a facility, building, structure or installation which emits or has the potential to emit any air pollutant regulated by EPA under the Act.

(j) "Potential to emit" means the capability at maximum design capacity to emit a pollutant after the application of air pollution control equipment. Annual potential shall be based on the larger of the maximum annual rated capacity of the stationary source assuming continuous operation, or on a projection of actual annual emissions. Enforceable permit conditions on the type of materials combusted or processed may be used in determining the annual potential. Fugitive emissions, to the extent quantifiable, will be considered in determining annual potential for those stationary sources whose fugitive emissions are regulated by the applicable state implementation plan.

(k) "Source" means any source of air pollution subject to applicable legal requirements as defined in paragraph (c).

(l) "Technical Support Document" means the "Noncompliance Penalties Technical Support Document" which accompanies these regulations. The Technical Support Document appears as Appendix A to these regulations.

All other terms are defined as they are in the Act.

§ 66.4 Limitation on review of regulations.

No applicable legal requirement, which could have been reviewed or challenged by means of the timely filing of an appropriate petition, no provision of this part or Part 67 or Appendices A, B or C, may be challenged, reviewed or re-examined in any hearing conducted under this part or Part 67. This limitation on review includes, but is not limited to:

(a) Arguments that the statute is more or less restrictive than the regulations, e.g., that exemptions other than those provided herein should be granted.

(b) Arguments that the economic model does not accurately calculate the economic benefits of noncompliance, or that parameters, terms and conditions other than those provided for in the model should be used or that evidence other than that described in the Technical Support Document for establishing inputs should be considered.

§ 66.5 Savings clause.

Proceedings under these regulations for imposition of a penalty under Section 120 are in addition to any other proceedings related to permits, orders, payments, sanctions or other requirements or State of Federal law. No action under this part or Part 67 shall affect in any way any administrative, civil or criminal enforcement proceed-

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ing brought under any provision of the Clean Air Act or State or local law.

§ 66.6 Effect of litigation; time limits.

(a) The existence of any litigation on the validity of these regulations shall not affect the authority of the Agency to issue notices of noncompliance or to conduct subsequent administrative proceedings under Parts 66 and 67.

(b) Failure of the Administrator or the Presiding Officer at a hearing to meet any of the time limits contained in Parts 66 and 67 shall not affect the validity of any proceeding under these regulations.

(c) The filing of any petition for reconsideration under this part or Part 67 or the institution of EPA review of a State determination under Part 67 shall not toll the accrual of noncompliance penalties. The penalty will be calculated from the date on which the source owner or operator receives a notice of noncompliance.

Subpart B—Notice of Noncompliance

§ 66.11 Issuance of notices of noncompliance.

(a) The Administrator shall issue a notice of noncompliance to the owner or operator of any source which he determines is in violation of applicable legal requirements and which is located in a State without an approved Section 120 program.

(b) The Administrator shall send a notice of noncompliance to the owner or operator of any source located in a State with an approved Section 120 program when he determines as provided in Part 67 that the source is in violation of applicable legal requirements and the State has failed to send a notice of noncompliance to it, or has failed to pursue diligently any subsequent steps for the assessment or collection of the penalty.

(c) Failure of EPA or a State to issue a notice of noncompliance within 30 days after discovery of a violation shall not affect the obligation of a source owner or operator to pay a noncompliance penalty but shall affect the date from which the penalty is calculated. The penalty shall be calculated from the earliest date that the owner or operator of the source received a notice of noncompliance under this section, whether issued by EPA or the State.

§ 66.12 Content of notices of noncompliance.

(a) Each notice of noncompliance shall be in writing and shall include:

(1) A specific reference to each applicable legal requirement of which the source is in violation;

(2) A brief statement of the factual basis for the finding of violation, together with a reference to any supporting materials and a statement of when and where they may be inspected;

(3) Instructions on calculating the amount of the penalty owed and the schedule for payments. Such instructions shall include (i) a statement of the date from which penalties should be calculated and (ii) a copy of the Technical Support Document and the Manual;

(4) Notice of the right to petition for a hearing to challenge the finding of noncompliance or to claim an exemption; and

(5) Notice that the penalty continues to accrue during the pendency of any hearings granted under this part or Part 67.

(b) Each notice of noncompliance shall be transmitted to the source owner or operator either by personal service or by registered or certified mail, return receipt requested.

§ 66.13 Duties of source owner or operator upon receipt of a notice of noncompliance.

(a) Within forty-five days after receiving a notice of noncompliance a source owner or operator shall either:

(1) Calculate the amount of the penalty owed and the appropriate quarterly payment schedule, as provided in the Technical Support Document and Instruction Manual, and transmit that calculation, together with supporting data sufficient to allow verification of the penalty calculation, to the Administrator; or

(2) Submit a petition for reconsideration, alleging that the source is not in violation of applicable legal require-

ments or that the source owner or operator is entitled to an exemption pursuant to §§ 66.31 through 66.33, or both. A source owner or operator must present both grounds in the petition if he wishes to preserve a claim to an exemption in the event that the source is found to be in violation. Issues relating to the existence of a violation or entitlement to an exemption not raised in the petition shall be deemed waived.

(b) Any submittal pursuant to this subsection shall specify the identity of the person responsible for the payment of any noncompliance penalty, and to whom any reimbursement, if necessary, shall be sent.

(c) A source owner or operator may amend any petition for reconsideration pursuant to paragraph (a) of this section within 45 days from receipt of a notice of noncompliance. Amendment of such petition after 45 days will be permitted only if based on unforeseeable conditions occurring after termination of the 45 day period, or upon consent of the Administrator.

Subpart C—Calculation of Noncompliance Penalties

§ 66.21 How to calculate the penalty.

(a) All noncompliance penalties shall be calculated in accordance with the Technical Support Document and the Manual.

(b) Where the Administrator determines that no existing technology or other emissions control method results in emission levels which satisfy the applicable legal requirement, the penalty calculation shall be based on the cost of the capital equipment, operation and maintenance practices, or other methods of control which best approximates the degree of control required. In such a case, the Administrator may include in the penalty the costs of participation in an EPA approved research and development program where he determines that such participation would be appropriate. Information on appropriate research and development programs will be available from the regional offices or from the Office of Research and Development.

§ 66.22 Contracting out penalty calculation.

Upon the failure of a source owner or operator, who does not submit a petition for reconsideration as provided in § 66.13(a)(2), to submit the information described in § 66.13(a)(1) within 45 days of receipt of a notice of noncompliance, or upon submission of incorrect information as determined pursuant to § 66.51, the Administrator may enter into a contract with any qualified person who is not an affiliated entity and who has no financial interest in the owner or operator of the source to assist in determining the amount of the penalty assessment or payment schedule with respect to such source owner or operator. The cost of this contract may be added to the penalty to be assessed against the owner or operator of the source. The data used in calculating the penalty shall be furnished to the source owner or operator at the time that the penalty calculation is reported.

§ 66.23 Interim recalculation of penalty.

(a) The Administrator, upon concluding that a previously approved penalty calculation no longer is accurate, may:

(1) Request, in writing, that the source owner or operator submit a revised calculation in the form specified in § 66.13(a). The Administrator shall respond to any information submitted in accordance with the provisions of § 66.51.

(2) Notify the source owner or operator, in writing, that the penalty has been recalculated based upon information in the Administrator's possession. The source owner or operator shall respond as provided in § 66.52.

(b) If a source owner or operator believes that, because of changed circumstances, a penalty calculation which has been accepted by EPA no longer is accurate, he may submit a revised penalty calculation and schedule to the Administrator. The revised calculation shall be in the form specified in § 66.13(a)(1). The Administrator shall respond in accordance with the provisions of § 66.51. The decision to accept the interim calculation or to grant a hearing on this issue shall be

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solely within the discretion of the Administrator.

Subpart D—Exemption Requests; Revocation of Exemptions

§ 66.31 Exemptions based on an order, extension or suspension.

(a) A source owner or operator who would otherwise be subject to a noncompliance penalty will be exempted from that penalty during the period for which, and upon a demonstration that, its noncompliance with applicable legal requirements is or was due solely to:

(1) A conversion by such source from the burning of petroleum products or natural gas, or both, as the permanent primary energy source to the burning of coal pursuant to an order under Section 113(d)(5) or Section 119 of the Act as in effect before August 7, 1977.

(2) In the case of a coal-burning source, the issuance of a prohibition to that source against burning petroleum products or natural gas, or both, by means of an order under Sections 2(a) and (b) of the Energy Supply and Environmental Coordination Act of 1974, the Powerplant and Industrial Fuel Use Act, or under any legislation which amends or supersedes these provisions, *Provided*, That the source had received an extension under the second sentence of Section 119(c)(1) of the Act as in effect before August 7, 1977.

(3) The use of innovative technology by the source owner or operator pursuant to an enforcement order under Section 113(d)(4) of the Act.

(4) An inability to comply with an applicable legal requirement resulting from reasons entirely beyond the control of the owner or operator of such source or of any affiliated entity, *Provided*, That (i) the source owner or operator has received an order under Section 113(d) (or an order under Section 113 issued before August 7, 1977) or a federal or EPA-approved State judicial decree or order which has the effect of permitting a delay in complying with the legal requirement at issue, and (ii) that the source owner or operator meets the requirements of paragraphs (c) and (d) of this section.

(5) The existence of an energy or employment emergency demonstrated by issuance of an order under Section 110(f) or 110(g) of the Act, unless such order is disapproved by EPA.

(b) To qualify for an exemption under this section, the source owner or operator must have received the order, extension or suspension or consent decree described in the paragraph of the section pursuant to which the exemption is claimed. No exemption may be sought which, if granted, would exceed the terms of the relevant extension, order, suspension, or consent decree, except as provided in paragraph (e) of this section. No exemption may be sought which is based on a claim that the source owner or operator is entitled to any such order, extension, suspension, or consent decree even though it has not been issued.

(c) In any exemption claim based on paragraph (a)(4) of this section, the source owner or operator must demonstrate that the inability to comply resulted from one of the following situations:

(1) Act of God;

(2) Fire;

(3) Embargo;

(4) Strike;

(5) The inability to obtain capital necessary to finance the installation of pollution control equipment or the use of other control measures, to the extent that such inability resulted from temporary, verifiable, general market conditions;

(6) The verifiable and unforeseeable failure of pollution control equipment and associated process equipment to perform at reasonably anticipated design levels despite the best efforts of the source owner or operator in designing, operating and maintaining the control and process equipment or other emission control methods, provided that such efforts were reasonably calculated to achieve compliance; or

(7) The complete inability of a supplier or contractor to furnish labor or materials necessary to achieve compliance, provided the source owner or operator demonstrates:

(i) That the source owner or operator or an affiliated entity in no

manner sought, caused, encouraged or contributed to the inability; and

(ii) That the source owner or operator in no way unduly delayed negotiation for needed equipment or fuel supply or made unusual demands not typical in its industry, or placed unusual restrictions on the supplier, or delayed in any other manner the delivery of goods or the completion of the necessary construction.

(d) (1) No exemption will be granted pursuant to paragraph (a)(4) of this section unless the owner or operator of the source demonstrates that, with respect to a situation described in paragraph (c), all reasonable steps were taken to prevent the situation causing the inability to comply, that procuring the needed pollution control equipment or fuel supply was given and continues to be given the highest possible priority in the planning and budgeting process of the owner or operator of the source, and that alternative sources of equipment and fuel have been explored without success.

(2) Any exemption granted under paragraph (a)(4) of this section shall cease to be effective when the inability to comply ceases to be entirely beyond the control of the source owner or operator as defined in this section.

(e) Except in the case of exemptions based on orders under Section 113 (d)(4) or (d)(5) or suspensions under Section 110(g), the Administrator may grant an exemption with retroactive effect to the date of the event giving rise to the Section 120 predicate order, extension, suspension, or consent decree. In such cases, the exemption from the noncompliance penalty shall run from the date that the basis for the exemption first occurred.

§ 66.32 De Minimis exemptions.

(a) The Administrator may, upon notice and opportunity for public hearing, exempt the owner or operator of any source from a penalty where he finds that a particular instance of noncompliance was *de minimis* in nature and duration.

(b) A petition for an exemption on the ground that the violation described in a notice of noncompliance was *de minimis* in nature and duration may only raise issues related to entitlement to an exemption and shall contain or be accompanied by supporting documentation. Issues relating to entitlement to a *de minimis* exemption not raised in the petition shall be deemed waived.

(c) In ruling upon such a petition, the Administrator shall consider:

(1) The magnitude of the excess emissions and whether the source's noncompliance is recurring or persistent;

(2) The steps the source owner or operator is taking to eliminate the cause of the excess emissions and to minimize such emissions;

(3) Whether any significant economic savings are likely to accrue to the owner or operator of the source as a result of the noncompliance;

(4) The character of the emissions, and their impact on ambient air quality; and

(5) The duration of the violation.

(d) A hearing on a petition for a *de minimis* exemption shall be informal. The hearing shall be scheduled upon notice to the public. Reasonable opportunity to testify and for submission of questions by the public to the petitioner shall be afforded. The decision of the hearing officer will be made in writing within a reasonable period of time after the close of the hearing.

§ 66.33 De Minimis exemptions: malfunctions.

(a) The Administrator may, upon notice and opportunity for a public hearing, exempt the owner or operator of a source if he finds with respect to a particular instance of noncompliance, that such noncompliance was *de minimis* in nature and duration, and was caused solely by a sudden and unavoidable breakdown of process or pollution control equipment.

(b) A petition for an exemption on the ground that the violation was *de minimis* and was caused by a sudden and unavoidable breakdown of process or pollution control equipment may only raise issues related to entitlement to an exemption and shall contain or be accompanied by supporting documentation. Issues relating to entitlement to an exemption that are not

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raised in the petition shall be deemed waived. In making such finding the Administrator shall consider whether:

(1) The violation was *de minimis* in nature and duration within the meaning of § 66.32;

(2) The air pollution control equipment, process equipment, or processes, including appropriate back-up systems, were designed, and have been maintained and operated in a manner consistent with good practice for minimizing emissions;

(3) Repair of the malfunctioning equipment was undertaken and carried out in an expeditious fashion as soon as the owner or operator knew or should have known that the malfunction existed or that applicable emission limitations were being violated or were likely to be violated;

(4) All practicable steps were taken to minimize the impact of the excess emissions (including any bypass) on ambient air quality;

(5) The excess emissions were not part of a pattern indicative of inadequate design, operation, or maintenance;

(6) Off-shift and overtime labor were utilized where necessary to ensure that repairs were made as expeditiously as possible or that emissions were minimized to the maximum extent possible; and

(7) The level of economic savings, if any, accruing to the source owner or operator was *de minimis.*

(c) Any activity that could have been foreseen, avoided or planned for, or any breakdown that could have been avoided by the exercise of reasonable diligence shall not constitute grounds for an exemption under this section. Such activities include, but are not limited to, sudden breakdowns avoidable by better maintenance procedures, phasing in and out of process equipment and routine maintenance.

(d) A hearing on any petition for an exemption based upon the unavoidable breakdown of pollution control equipment shall be informal. The hearing shall be scheduled upon notice to the public. Reasonable opportunity to testify and for submission of questions by the public to the petitioner shall be afforded. The decision of the hearing officer will be made in writing within a reasonable period of time after the close of the hearing.

§ 66.34 Termination of exemptions.

(a) Exemptions pursuant to § 66.31(a) (1), (2), (3), and (5) will cease to be effective upon termination or revocation of the order on which the exemption is based.

(b) Exemptions pursuant to § 66.31(a)(4) will cease to be effective when the order or decree is terminated or revoked, or the inability to comply ceases to be for reasons entirely beyond the control of the source owner or operator as defined in § 66.31(c).

(c) Exemptions granted pursuant to §§ 66.32 or 66.33 shall terminate at the time specified in the exemption.

(d) The Administrator shall notify the source owner or operator, in writing, that the exemption has terminated, and shall specify the date from which the penalty shall be calculated. The notice shall be transmitted as required by § 66.12. The source owner or operator shall respond to this notice within 45 days of its receipt and in the form provided in § 66.13.

§ 66.35 Revocation of exemptions.

(a) The Administrator may upon notice and opportunity for a hearing revoke an exemption granted to the owner or operator of any source at any time in accordance with paragraphs (b) and (c) below.

(b) An exemption may be revoked and a penalty for the period of non-exempted noncompliance assessed if:

(1) The grounds for the exemption no longer exist or never did exist, or

(2) In the case of an exemption under § 66.31, the source owner or operator has failed to comply with any interim emission control requirements or schedules of compliance (including increments of progress) contained in the extension, order, suspension or EPA-approved consent decree on which the exemption was based.

(c) The Administrator shall provide the source owner or operator written notice containing the information required by § 66.12 and a statement of the reasons for revocation. The notice shall also specify the date from which

the source owner or operator must calculate a penalty. The notice shall be transmitted as required by § 66.12. The source owner or operator shall respond to this notice within 45 days of its receipt and in the form provided in § 66.13.

Subpart E—Decisions on Exemption Requests and Challenges to Notices of Noncompliance

§ 66.41 Decision on petitions.

(a) Within thirty days after receiving a petition filed under § 66.13, the Administrator shall notify the source owner or operator in writing that:

(1) The petition demonstrates that the source owner or operator is entitled to part or all of the relief requested and that the notice of noncompliance is withdrawn or modified accordingly;

(2) The petition of the owner or operator of the source presents no information regarding the issues of whether the source is in violation of applicable legal requirements or is entitled to an exemption which, if true, would alter the liability of the source owner or operator, and that a hearing on the petition is denied;

(3) A hearing is granted on the issue of whether the source is in violation of applicable legal requirements or is entitled to an exemption under §§ 66.31, 66.32, 66.33, or on both;

(4) The information submitted is inadequate to enable EPA to determine whether the source owner or operator is entitled to the relief requested. The Administrator shall specify what deficiencies exist and request that the source owner or operator supplement his petition within thirty days of receipt of that request. If the petition is not supplemented adequately within this time, the Administrator may deny the relief requested. Any supplemental material provided pursuant to the Administrator's request shall be evaluated as provided in paragraphs(a)(1)-(3) of this section.

(b) In granting any hearing pursuant to pragraph (a)(3) of this section, the Administrator may exclude particular fact questions from the hearing which do not qualify for a hearing under the criteria set forth in paragraph (a)(2) of this section.

§ 66.42 Procedure for hearings.

(a) Except as provided in §§ 66.32 and 66.33, hearings granted under § 66.41(a)(3) shall be held as provided in Subpart J.

(b) If hearings are granted pursuant to both §§ 66.32 or 66.33 and under Subpart J, a consolidated hearing in accordance with Subpart J shall be held. At the consolidated hearing the issues that would otherwise have been considered at a hearing under §§ 66.32 or 66.33 shall be considered pursuant to the procedures for a hearing provided in those sections.

(c) The Presiding Officer at a hearing granted under § 66.41 shall issue an initial decision within 90 days after the Administrator grants the hearing, unless the duration of the hearing or the deadline for decision is extended by the Presiding Officer upon agreement of the parties. Failure to issue a decision (whether or not by consent) within 90 days shall not affect the validity of the proceedings or the accrual of penalties in any manner.

§ 66.43 Final decision; submission of penalty calculation.

Within forty-five days after EPA has notified the owner or operator of a source of the final Agency decision that it is in violation of applicable legal requirements or is not entitled to an exemption, the owner or operator shall submit the information required by § 66.13(a), including appropriate compliance and payment schedules and extra interest owed for the period of delay. The penalty shall be calculated from the date of receipt of the original notice of noncompliance.

Subpart F—Review of Penalty Calculation

§ 66.51 Action upon receipt of penalty calculation.

(a) Within thirty days after receipt of a penalty calculation provided pursuant to §§ 66.13(a)(1) or 66.43, the Administrator shall notify the source owner or operator in writing, that:

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(1) The penalty is provisionally accepted as calculated, subject to any recalculation that may be necessary under § 66.72 after the source has achieved compliance; or

(2) The penalty is incorrect and has been recalculated based on the data provided by the source owner or operator, or other data. The Administrator shall provide a brief statement of the basis for the recalculation and shall identify when and where any supporting data may be examined. The Administrator shall also notify the source owner or operator of the right to petition for a hearing under § 66.52; or

(3) The source owner or operator has not submitted any calculation, or the information submitted is inadequate to enable EPA to verify the owner or operator's penalty calculation. The Administrator shall specify what deficiencies exist and request the source owner or operator to supplement his submission within thirty days of receipt of that request. If an inadequate supplemental submission is made within this time, EPA may calculate the penalty itself or as provided in § 66.22.

(b) Supplemental material provided pursuant to subsection (a)(3) of this section shall be evaluated as provided in paragraph (a).

§ 66.52 Petitions for reconsideration of calculation.

Within forty-five days after receipt of notice under § 66.51(a)(2) that the penalty has been recalculated by EPA, a source owner or operator who wishes to challenge EPA's recalculation shall petition in writing for reconsideration. A statement of all arguments on which the owner or operator relies, including all necessary supporting data and a substitute penalty calculation and payment schedule shall be included in or accompany this petition. Issues not raised in the petition shall be deemed waived.

§ 66.53 Decisions on petitions.

Within thirty days after receiving a petition for reconsideration under § 66.52 the Administrator shall:

(a) Accept the penalty calculation of the owner or operator to the extent the Administrator concludes it is correct; or

(b) Deny a hearing and affirm the calculation to the extent he concludes that the petition of the owner or operator does not present information which, if true, would alter the amount of the penalty; or

(c) Grant a hearing to the extent he concludes that the petition of the source owner or operator raises such questions.

§ 66.54 Procedures for hearing.

(a) Hearings granted under § 66.53 shall be held as provided in Subpart J.

(b) The Presiding Officer at a hearing granted under § 66.53 shall issue an initial decision within ninety days after the Administrator grants the hearing, unless the duration of the hearing or the deadline for decision is extended by the Presiding Officer upon agreement of the parties. Failure to issue a decision (whether or not by consent) within 90 days shall not affect the validity of the proceedings or the accrual of penalties in any manner.

Subpart G—Payment

§ 66.61 Duty to pay.

(a) Except where the owner or operator has submitted a petition pursuant to § 66.13(a)(2), the first installment of the penalty shall be paid on the date six months after receipt of the notice of noncompliance.

(b) Where the source owner has filed a petition pursuant to § 66.13(a)(2), the first installment consisting of payment of penalties for all quarters "missed" as well as for the upcoming quarter shall be paid on the date six months after a final administrative decision affirming the source owner or operator's liability. Installments shall be paid quarterly thereafter until compliance is achieved. Quarters shall be measured in increments of three calendar months from the date the first payment is due.

(c) A source owner or operator who submits a petition pursuant to § 66.52 shall pay the penalty amount calculated by the owner or operator under §§ 66.13 or 66.43 or any penalty calcu-

lated by EPA where the owner or operator has failed to calculate such penalty. Within 45 days after EPA has notified the owner or operator of a final administrative action after hearings on such petition, the owner or operator shall submit any necessary modification to the penalty. The revised penalty will be calculated in accordance with the Technical Support Document and the Manual, and a revised schedule, including appropriate adjustments for overpayments or underpayments made, will be established.

§ 66.62 Method of payment.

Payments in excess of $10,000 under this part shall be made by wire transfer payable to the United States Treasury. Payments under this Part which are less than $10,000 shall be made by cashier's or certified check made payable to the United States Treasury, sent by registered mail, return receipt requested, and addressed to the Administrator, Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460. Payment by check is made on the due date if it is postmarked on or before the due date. Payment by wire transfer is made on the due date if the Treasury's account is credited on or before the due date.

§ 66.63 Nonpayment penalty.

(a) Any source owner or operator who fails to make timely payment under § 66.61 shall pay in addition to the penalty owed a quarterly nonpayment penalty. The nonpayment penalty shall be calculated as of the due date of the noncompliance penalty payment and shall be equal to 20 percent of the aggregate amount of the noncompliance penalties and nonpayment penalties due and owing from the owner or operator on the due date. Partial payments shall be credited first against the nonpayment penalty, then against the noncompliance penalty.

(b) The Administrator shall notify the source owner or operator in writing of the amount of any nonpayment penalty for which the owner or operator is liable. Failure of the Administrator to provide such notice immediately shall not affect the legal obligation of the source owner or operator to pay such penalty. Such nonpayment penalty, as well as the past due noncompliance penalty, shall be payable immediately.

Subpart H—Compliance and Final Adjustment

§ 66.71 Determination of compliance.

(a) An owner or operator of a source who is paying a noncompliance penalty under this Part shall notify the Administrator in writing when he believes that the source has come into and is maintaining compliance with all applicable legal requirements. The notice shall be accompanied by any factual data, analytical materials, and legal arguments which the source owner or operator believes support such claim.

(b) Within 30 days of receipt of a source owner's submittal, the Administrator shall determine whether the source has achieved and is maintaining compliance with applicable legal requirements, and shall notify the source owner or operator of this determination in writing. If the Administrator is unable to conclude, on the basis of the information submitted, whether the source has achieved and is maintaining compliance with applicable legal requirements, he shall inform the owner or operator of any additional material that is needed. Within 30 days of receipt of such additional material, the Administrator shall determine whether the source has achieved and is maintaining compliance, and shall notify the source owner or operator of this determination in writing.

(c) If the Administrator determines that the source has not achieved or is not maintaining compliance with applicable legal requirements, the source owner or operator may petition for reconsideration within 30 days of receipt of the determination. The source owner or operator shall include in this petition any necessary supporting material. Issues not raised in the petition will be deemed waived. The procedures of § 66.41 shall be followed upon the receipt of such petition.

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§ 66.72 Additional payment or reimbursement.

(a) Within 120 days after the source owner or operator receives notification pursuant to § 66.71(b) that it has achieved and is maintaining compliance with applicable legal requirements, or within 120 days after receipt of a decision to that effect upon petition and hearing, or within 120 days after receipt of a decision to that effect upon an appeal to the Administrator, the source owner or operator shall submit to the Administrator a revised penalty calculation as provided in the Technical Support Document and the Manual, together with data necessary for verification. The revised calculation shall include interest on any underpayment.

(b) Within thirty days after receiving a revised penalty calculation provided pursuant to paragraph (a) of this section, the Administrator shall inform the source owner or operator in writing that:

(1) The revised penalty is correct as calculated;

(2) The revised penalty is incorrect and has been recalculated based on the data provided by the source owner or operator or on other data. The Administrator shall provide to the source owner or operator a brief statement of the basis of the recalculation and shall identify when and where any supporting data may be examined. The Administrator shall also notify the source owner or operator of the right to petition for reconsideration under § 66.73; or

(3) The source owner or operator has not submitted any penalty calculation, or has not submitted enough material to enable EPA to verify the penalty calculation. The Administrator shall specify what deficiencies exist and shall require the source owner or operator to furnish the supplemental material within thirty days of receipt of the notice. The supplemental material submitted will be evaluated in the same manner as the original submittal.

(c) If a source owner or operator fails to submit or to complete a revised penalty calculation when due under this section or the calculation submitted is incorrect, the Administrator may recalculate the penalty or may enter into a contract for independent calculation of the penalty as provided in § 66.22.

§ 66.73 Petition for reconsideration and procedure for hearing.

Within forty-five days of receipt of a notice under § 66.72(b) (2) a source owner or operator may petition for reconsideration in the form and manner provided in § 66.52. The petition shall be evaluated as provided in § 66.53 and any hearing shall be held in conformity with § 66.54.

§ 66.74 Payment or reimbursement.

(a) Within thirty days after any adjustment of a noncompliance penalty under this Subpart has become administratively final:

(1) Any deficiency owed by the source owner or operator shall be paid as provided in § 66.62.

(2) Any reimbursement shall be paid by check from the United States payable to the order of the source owner or operator, and sent by registered or certified mail, return receipt requested.

(b) Any payment under paragraph (a) of this section, shall include interest on the amount of the deficiency or reimbursement due, from the date the deficiency or reimbursement arose, at a rate determined by the Secretary of the Treasury. Such payment shall be calculated in accordance with the Technical Support Document and the Manual.

(c) Any source owner or operator who fails to make timely payment of a deficiency shall pay a nonpayment penalty. The nonpayment penalty shall be calculated as of the due date of the deficiency payment and shall be equal to 20% of the deficiency not paid. Such nonpayment penalty (in addition to the amount of the deficiency owed) shall be payable immediately. If any part of the nonpayment penalty or deficiency shall remain unpaid at the end of three calendar months from the due date of the deficiency, a further nonpayment penalty shall be due equal to 20% of the sum of all payments due and owing. Partial payments shall be credited first against

the nonpayment penalty, then the deficiency.

Subpart I—Final Action

§ 66.81 Final action.

(a) A final Agency action appealable to the courts by the source owner or operator includes and is limited to the following, provided the conditions of paragraph (b) of this section are met:

(1) A notice of determination that a source is in violation of applicable legal requirements;

(2) A notice of decision to deny or revoke an exemption under Subpart D;

(3) A notice of revision by EPA of a penalty calculation or schedule under Subpart F;

(4) A notice of decision by EPA that the source is not in final compliance or any revision by EPA of a final penalty calculation under Subpart H; and

(5) A notice of denial of a petition for reconsideration under §§ 66.41, 66.53, 66.71 or 66.73.

(6) A decision by the Administrator upon completion of any review of a State action pursuant to Part 67.

(b) The actions listed in paragraph (a) of this section constitute final Agency action only if all administrative remedies have been exhausted. To exhaust administrative remedies a source owner or operator must first petition for reconsideration of the decision in question and, if unsuccessful after hearing or after denial of hearing, appeal the decision in question to the Administrator. The action becomes final upon the completion of review by the Administrator and notice thereof to the owner or operator of the source.

(c) Where a petition seeks reconsideration both of the finding of noncompliance and of the finding of liability on the ground that the source owner or operator is entitled to an exemption, both questions must be decided before any review by the Administrator is sought, except on agreement of the parties.

Subpart J—Supplemental Rules for Formal Adjudicatory Hearings

§ 66.91 Applicability of supplemental rules.

The Supplemental Rules in this subpart, in conjunction with the Consolidated Rules of Practice (40 CFR Part 22) shall govern all hearings held under this part. To the extent that the provisions of these Supplemental Rules or any other provision of this part are inconsistent with the Consolidated Rules, the provisions of this Part shall govern.

§ 66.92 Commencement of hearings.

(a) The provisions of 40 CFR 22.08 (Consolidated Rules of Practice) shall become applicable when the Administrator grants a hearing.

(b) Upon granting a hearing the Administrator shall immediately transmit to the appropriate Regional Hearing Clerk two copies of the notice granting the hearing and:

(1) In the case of a hearing pursuant to § 66.42, two copies of the notice of noncompliance under § 66.11 (or the revocation notice under § 66.34) and of the petition of the owner or operator under § 66.13, together with supporting documents; and

(2) In the case of a hearing pursuant to § 66.53 or § 66.73, two copies of the penalty calculation of the source owner or operator provided pursuant to § 66.13(a) or § 66.72, and of any Agency recalculation pursuant to Section 66.51(a)(2) or 66.72(b)(2), and of the petition of the source owner or operator for reconsideration pursuant to §§ 66.52 or 66.73, together with supporting documents.

(3) The Regional Hearing Clerk shall open and maintain the official file of the proceeding upon receipt of the documents referred to in paragraphs (b)(1) and (2) of this section.

(c) Upon granting a hearing the Administrator shall request the Chief Administrative Law Judge to designate an Administrative Law Judge to serve as the Presiding Officer. The Chief Administrative Law Judge shall make this designation within seven days of receiving the request, and shall notify the Regional Hearing Clerk of his

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action. The Regional Hearing Clerk shall forward to the Presiding Officer one set of the documents described in paragraph (b).

§ 66.93 Time limits.

The Presiding Officer upon designation shall notify the parties and shall, if appropriate, schedule a prehearing conference (or alternative procedures) under 40 CFR 22.19 and shall notify the parties of the date of hearing under 40 CFR 22.21. The Presiding Officer shall issue an initial decision no later than ninety days after the hearing is granted, unless an extension of the hearing schedule or of the deadline for decision is agreed to by the parties. To that end, the Presiding Officer may establish such deadlines as are reasonable and necessary. Failure to issue a decision withing 90 days or further extended deadline (whether or not by consent) shall not affect the validity of the proceedings.

§ 66.94 Presentation of evidence.

(a) In hearings pursuant to § 66.42 EPA shall present evidence of violation of applicable legal requirements. The source owner or operator shall then present any rebuttal evidence.

(b) In hearings under § 66.42 the source owner or operator shall present evidence of entitlement to an exemption. EPA shall then present any rebuttal evidence.

(c) In hearings under §§ 66.54 and 66.73 EPA shall present evidence that its calculation or revisions of the source owner or operator's penalty calculations are correct. The source owner or operator shall then present any rebuttal evidence.

(d) Each matter of controversy shall be determined by the Presiding Officer upon a preponderance of the evidence.

(e) Any documentation submitted pursuant to § 66.92(b) shall automatically be received into evidence in the hearing.

§ 66.95 Decisions of the Presiding Officer; Appeal to the Administrator.

(a) The Presiding Officer shall dispose of the issues raised in the hearing in a single written decision. Such decision shall terminate the Presiding Officer's consideration of those issues.

(b) Penalty calculations and payment schedules, if any, established by the decision of the Presiding Officer shall be based solely on the parameters, terms and conditions of the Technical Support Document, Manual, and Computer Program.

(c) An appeal to the Administrator from a decision of the Presiding Officer shall be made by petition filed within twenty (20) days from receipt by a party of the Presiding Officer's decision. The Administrator shall rule on the appeal within 30 days of receipt of a petition. No appeal may be made before receipt of the decision of the Presiding Officer.

APPENDIX A—TECHNICAL SUPPORT DOCUMENT

NOTE: For text of Appendix A see Appendix A to Part 67.

APPENDIX B—INSTRUCTION MANUAL

NOTE: For text of Appendix B see Appendix B to Part 67.

APPENDIX C—COMPUTER PROGRAM

NOTE: For text of Appendix C see Appendix C to Part 67.

PART 67—EPA APPROVAL OF STATE NONCOMPLIANCE PENALTY PROGRAM

Subpart A—Purpose and Scope

Sec.

67.1 Purpose and scope.

Subpart B—Approval of State Programs

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67.21 Federal notice of noncompliance to owners or operators of sources in States with approved programs.

Subpart D—EPA Review of State Exemption Decisions

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Subpart E—EPA Review of State Penalty Assessments

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APPENDIX A—TECHNICAL SUPPORT DOCUMENT
APPENDIX B—INSTRUCTION MANUAL
APPENDIX C—COMPUTER PROGRAM

AUTHORITY: Sec. 120 of the Clean Air Act, as amended, 42 U.S.C. 7420.

SOURCE: 45 FR 50117, July 28, 1980, unless otherwise noted.

Subpart A—Purpose and Scope

§ 67.1 Purpose and scope.

This part describes the standards and procedures under which EPA will approve State programs for administering the noncompliance penalty program under Section 120 of the Clean Air Act and will evaluate actions taken by States with approved programs. Subpart A describes the purpose of the part. Subpart B states the conditions under which EPA will approve State programs to administer the noncompliance penalty provisions. Subparts C and D state when and how EPA will issue its own notices to owners or operators of sources in States with approved programs, and how it will review State decisions to grant or deny exemptions from the penalty. Finally, Subpart E states how EPA will review State assessments of a penalty.

Subpart B—Approval of State Programs

§ 67.11 Standards for approval of State programs.

(a) The Administrator shall approve any program submitted by a State, or by a local governmental agency where no program has been submitted by a State, for administering the noncompliance penalty provisions of Section 120 of the Clean Air Act upon finding that the program conforms to the requirements of the Act and to those of this part and 40 CFR Part 66. References to "State program" in this part shall be read as including local governmental agencies and their programs.

(b) The Administrator shall not approve any State program that does not provide explicitly for:

(1) Issuance of a notice of noncompliance, in a manner consistent with procedures under Part 66, upon discovery by the State or upon notification by EPA of a violation of applicable legal requirements, which notice satisfies the informational requirements set forth in Section 66.13.

(2) Levels of staffing and funding satisfactory, in the judgment of the Administrator, to implement and enforce the requirements of Section 120 in that State, together with adequate provision for maintaining such levels;

(3) A capability to carry out the financial analysis and procedures specified in these regulations and the Technical Support Document and Instruction Manual, together with adequate provision for maintaining such capability. Such capability may be provided by trained State personnel or through qualified contractors;

(4) Except as provided in paragraph (a)(6) of this section, an administrative hearing whenever the owner or operator of a source submits a petition for reconsideration of a notice of noncompliance on the ground that the source either is not in violation of applicable legal requirements, or is entitled to an exemption, or both, or submits a petition to challenge a recalculation of the penalty by the State, provided that such petitions raise issues of fact that would require a hearing under Part 66. This hearing need not conform to the requirements of 5 U.S.C. 554 as long as its procedures provide for:

(i) An initial decision by the hearing officer on the record;

(ii) A hearing officer who has not performed investigative or litigating functions in any enforcement action against the source owner or operator in question;

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(iii) Opportunity for public participation on reasonable notice, including intervention, by interested persons;

(iv) Opportunity for cross-examination or an equivalent opportunity for confrontation between persons advocating differing positions on material factual matters; and

(v) An initial decision by the hearing officer within ninety days of commencement of the hearing unless such period is extended upon agreement of the parties.

(5) Explicit provision for:

(i) notice to the Administrator of any determination granting an exemption, or finding a source in violation of applicable legal requirements, and any penalty calculation and payment schedule approved or calculated by the State, together with any information necessary to verify its accuracy;

(ii) within 30 days of receipt of a request from the Administrator, transmission of a copy of the record of the hearing held under paragraphs (a)(4) or (6) of this section, including any proffered evidence and a ruling on its admissibility and the State's decision on the merits; and

(iii) additional reporting and record keeping, if necessary, adequate to enable the Administrator to review the State's administration of the program and determine whether it conforms to the Act and to Part 66 of these regulations. Such requirements will be specified in the Notice of Delegation to the State.

(6) A hearing on the question of whether the owner or operator of a source is entitled to an exemption pursuant to §§ 66.32 or 66.33 may be informal. The hearing shall be scheduled upon notice to the public. Reasonable opportunity to testify and for submission of questions to the petitioner by members of the public shall be afforded. A record of the hearing shall be made, and the decision of the hearing officer made in writing within a reasonable period of time after the close of the hearing.

(c) The State may delegate all or part of its responsibilities under its program to a local governmental agency to implement the program within the jurisdiction of the local agency. *Provided* that the program of the local government agency meets the requirements of this section.

(d) No State penalty program or program of one of its agents shall be disapproved because it is more stringent than the program established by Part 66 or by Section 120 where the State or local agent concludes that it has independent authority under State or local law to implement and administer the more stringent portions of the program.

§ 67.12 Application for approval of program.

A state that wishes to administer a Section 120 program shall submit an application in writing to the Administrator describing its proposed program. All necessary supporting materials shall accompany the application.

§ 67.13 Approval.

(a) The Administrator shall evaluate any application submitted under § 67.12 and shall:

(1) Approve the program and delegate authority to the State to administer the program if he determines that the requirements of § 67.11 have been and will be met; or

(2) Request additional information if he determines that the information submitted is not sufficient to allow him to determine whether the requirements of § 67.11 have been and will be met; or

(3) Disapprove the State program if he determines that the information submitted establishes that the requirements of § 67.11 have not been or will not be met.

(b) The Administrator shall notify the State in writing of his action under pragraph (a) of this section and shall state the reasons for his action.

(c) In all cases of delegation (whether or not express provision is made in the notice of delegation) the Administrator shall retain continuing authority to issue notices of noncompliance, review exemption requests or penalty calculations, or take any other steps set forth in Part 66 to assess and collect these penalties. Such authority shall be exercised pursuant to the provisions of § 67.21.

(d) The Administrator shall retain exclusive authority to assess and collect penalties against source owners or operators of facilities in the State who were issued notices of noncompliance pursuant to Part 66 prior to the effective date of the delegation, except to the extent the Administrator specifically delegates such authority to the State.

§ 67.14 Amendments to the program.

A State or local agent with a program approved pursuant to § 67.13 may propose amendments to that program to the Administrator. The Administrator shall evaluate whether the State or local agent's program as amended would conform to the requirements of § 67.11 and shall respond as provided in § 67.13.

§ 67.15 Revocation.

If the Administrator determines that a State with a program approved under § 67.13 is not administering the program in conformity with the requirements of the Act or § 67.11, or the delegation of authority, he shall provide the State written notice of that determination, setting forth his reasons. Copies of all supporting materials shall accompany the notice if requested, or shall be placed on file in the appropriate Regional Office and made available for inspection during normal business hours. The State shall have 90 days in which to respond in writing to this determination. If the Administrator finds after reviewing the State response that (a) the State is in fact administering the program in conformity with § 67.11, or (b) there are reasonable grounds to believe the State program will immediately be brought into conformity with that section, he shall withdraw his determination. If he finds that neither of these conditions has been met, he shall withdraw the delegation of authority to the State.

Subpart C—Federal Notice of Noncompliance to Sources in States With Approved Programs

§ 67.21 Federal notice of noncompliance to owners or operators of sources in States with approved programs.

(a) The Administrator shall issue a notice of noncompliance to the owner or operator of any source in a State with an approved program if he determines that the State or its local agent has failed to issue such notice, provided that he shall first give 30 days notice to the State of his intent to issue a notice of noncompliance to the owner or operator of the source in question unless the State or its agent does so first. Any notice issued by the Administrator pursuant to this section shall be deemed to be issued pursuant to the provisions of Part 66.

(b) The issuance of a notice of noncompliance shall operate to withdraw EPA delegation of authority to the State with respect to the particular facility in question.

(c) If the Administrator determines that the State or local agent has issued a notice of noncompliance but has failed to pursue diligently subsequent steps for the assessment and collection of the penalty, he shall notify the State of his intent to withdraw delegation of authority to the State with respect to the facility in question and take appropriate actions pursuant to Part 66 unless the State or local agent, within 30 days, takes appropriate action in accordance with the requirements of this part. In either case the penalty will be calculated from the date of the State notice.

Subpart D—EPA Review of State Compliance or Exemption Decisions

§ 67.31 Review by the Administrator.

(a) The Administrator may, on his own initiative, review any determination by a State or its agent that a source owner or operator is or is not in compliance with applicable legal requirements or is or is not entitled to an exemption, to determine whether that determination conforms to the re-

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quirements of the Act and Part 66 (as modified by § 67.11).

(b) The Administrator shall review any such determination upon receipt of a petition alleging that the State's determination does not conform to the requirements of the Act and Part 66 (as modified by § 67.11). Such petition must be filed within 20 days of issuance of the State's decision.

(c) The Administrator shall give notice in writing to the State or local agent, to the owner or operator of the source, and to the petitioner of his intent to review the determination. Such notice shall be given within 90 days of the Administrator's receipt of the State or local agent's determination. Unless otherwise provided, such notice shall not withdraw EPA's delegation of authority to the State or local agent over the particular facility in question.

(d) No such State determination shall become final until the expiration of 90 days after the Administrator's receipt of the notice required by § 67.11(b)(5).

(1) If the Administrator does not issue a notice of intent to review within that period, the State determination shall, upon expiration of such period, constitute final action of the Administrator under Section 120 of the Act.

(2) If the Administrator issues a notice of intent to review within that period, the State determination shall not become final until the Administrator takes final action after reviewing the determination.

(e) Except as otherwise provided, a State determination shall be approved if there was a reasonable basis in law and in fact for making the determination.

§ 67.32 Procedure where no formal State hearing was held.

(a) In reviewing a decision that a source is in compliance with applicable legal requirements or entitled to an exemption for which no hearing conforming to § 67.11(b) (4) or (6) was held, the Administrator shall evaluate the accuracy and adequacy of the documents transmitted to him pursuant to § 67.11(b)(5) and shall invite submission of comments on issues identified by him as relevant to his review.

(b) If the Administrator concludes that no hearing need have been held and that the State determination was correct, he shall notify the State, the source owner or operator, and other participants of his determination, which shall constitute final agency action by EPA under authority of section 120. If the Administrator concludes that the petition of the source owner or operator presented information which, if true, would have altered the owner or operator's liability for a penalty, he shall upon notice to the State or local agent schedule a hearing in accordance with Subpart E of Part 66. Such notice shall operate as a withdrawal of EPA's delegation of authority to the State or local agent over the facility in question unless the State or local agent schedules a hearing within 15 days of receipt of the notice.

(c) If the Administrator concludes that the State determination did not conform to the requirements of the Act or of Part 66 (as modified by § 67.11), he shall by written notice revoke the determination. Such revocation shall operate as a withdrawal of EPA's delegation of authority to the State or local agent over the facility in question. The source owner or operator may then petition for review of the Administrator's decision pursuant to the provisions of § 66.13.

(d) Unless otherwise provided in the Administrator's notice to the State or local agent, any noncompliance penalties owed by the source owner or operator shall be paid to the State or local agent. The Administrator shall send a copy of this notice to the source owner or operator.

§ 67.33 Procedure where a formal State hearing was held.

(a) In reviewing a decision that a source is in compliance with applicable legal requirements or is entitled to an exemption for which a hearing conforming to § 67.11(b) (4) or (6) was held, the Administrator may invite comment on issues identified by him as relevant to his review and shall propose or make findings as to the cor-

rectness of the determination and the accuracy and adequacy of the material transmitted pursuant to § 67.11(b)(5).

(b) The Administrator shall notify all participants in the State hearing of his findings and conclusions. If the Administrator concludes that the State determination conformed to the requirements of the Act and of Part 66 (as modified by § 66.11), the Administrator's determination shall constitute final administrative action by EPA under authority of Section 120. If the Administrator finds that the State determination did not conform to the requirements of the Act and of Part 66 (as modified by § 67.11), the findings shall constitute proposed findings and the notice shall invite participants to file exceptions thereto. If the Administrator considers it desirable, he may schedule a time for argument.

(c) Within 60 days of receipt of any briefs or exceptions or after oral argument pursuant to subsection (b), the Administrator shall affirm, modify, or revoke his proposed findings that the State's determination did not conform to the requirements of the Act or of Part 66 (as modified by § 67.11). The decision shall be in writing. Notice and a copy of the decision shall be provided to the source owner or operator and to all other participants in the State hearing. The decision shall constitute a final administrative action by EPA under authority of Section 120.

(d) If the Administrator finds that deficiencies in the hearing record prevent him from determining whether the determination of the State or local agent conformed to the requirements of the Act and Part 66 (as modified by § 67.11), he shall notify the State or local agent of his finding and specify what deficiencies exist and schedule a hearing pursuant to Subpart E of Part 66. Such notice shall operate as a withdrawal of EPA's delegation of authority to the State or local agent over the facility in question unless the State or local agent schedules a supplemental hearing to correct the deficiencies within 15 days of receipt of the notice.

(e) If the Administrator concludes that the source is in violation of applicable legal requirements or is not entitled to an exemption, or both, and unless otherwise ordered in the decision, the source owner or operator shall submit a penalty calculation to the State within 45 days of receipt of the notice of determination.

Subpart E—EPA Review of State Penalty Assessments

§ 67.41 When EPA may review.

(a) The Administrator may on his own initiative or on petition review any initial, interim, or final penalty calculation made or approved by the State or local agent to determine whether it conforms to the requirements of the Act, of Part 66, of the Technical Support Document and the Instruction Manual. The Administrator shall notify the State or local agent in writing of his intention to review the calculation within 60 days of receipt by EPA of the calculation or any item considered by the State in making or approving such calculation, whichever occurs later.

(b) No such State determination shall become final until the expiration of 90 days after the Administrator's receipt of the notice required by § 67.11(b)(5).

(1) If the Administrator does not issue a notice of intent to review within that period, the State determination shall, upon expiration of such period, constitute final action of the Administrator under Section 120 of the Act.

(2) If the Administrator issues a notice of intent to review within that period, the State determination shall not become final until the Administrator takes final action after reviewing the determination.

(c) Except as otherwise provided, a State determination shall be approved if there was a reasonable basis in law and in fact for making the determination.

§ 67.42 Procedure where no formal State hearing was held.

(a) In reviewing a penalty calculation for which no hearing conforming to the requirements of § 67.11(b)(4) was held, the Administrator shall evaluate the accuracy and adequacy of the data contained in the documents

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transmitted to him pursuant to § 67.11(b)(5) and shall invite comments on issues identified by him as relevant to his review.

(b) If the Administrator concludes that no hearing need have been held and that the State determination was correct, he shall notify the State, the source owner or operator, and other participants of his determination, which shall constitute final agency action by EPA under authority of Section 120. If the Administrator concludes that the petition of the source owner or operator for reconsideration of a recalculation presented information which, if true, would have altered the amount of the penalty calculated, he shall upon notice to the State schedule a hearing in accordance with Subpart F of Part 66. Such notice shall operate as a withdrawal of EPA's delegation of authority to the State or local agent over the facility in question unless the State or local agent schedules a hearing within 15 days of receipt of the notice.

(c) If the Administrator concludes that the determination of the State or local agent not to hold a hearing was proper but that the penalty calculation does not conform to the requirements of the Act or of Part 66, he shall by written notice revoke the determination and issue a notice of recalculation to the source owner or operator pursuant to § 66.51. A copy of the notice of recalculation shall be provided to the State or local agent. The notice of recalculation shall constitute final administrative action by EPA under authority of Section 120 unless the source owner or operator petitions for reconsideration under § 66.52, in which case it shall operate as a withdrawal by EPA of its delegation of authority to the State or local agent over the facility in question.

(d) Unless otherwise provided in the Administrator's notice, noncompliance penalties finally determined to be owed shall be paid to the State or local agent.

§ 67.43 Procedure where a formal State hearing was held.

(a) In reviewing a penalty calculation for which a hearing conforming to § 67.11(b)(4) was held, the Administrator may invite comment on issues identified by him as relevant to his review and shall propose or make findings as to the correctness of the determination and shall evaluate the accuracy and adequacy of the material transmitted pursuant to § 67.11(b)(5).

(b) The Administrator shall notify all participants in the State hearing of his findings and conclusions. If the Administrator finds that the State determination conformed to the requirements of the Act, Part 66 (as modified by § 67.11), the Technical Support Document, and the Instruction Manual, his determination shall constitute a final action pursuant to Section 120. If the Administrator finds that the State determination did not conform to the requirements of the Act or of Part 66 (as modified by § 67.11) or to the Technical Support Document or Instruction Manual, the findings shall constitute proposed findings, and the notice shall invite participants to file exceptions to his proposed findings and, if necessary, schedule a time for argument.

(c) Within 60 days of receipt of any briefs or exceptions or after oral argument, the Administrator shall affirm, modify, or revoke his proposed findings that the State or local agent's determination did not conform to the requirements of the Act or of Part 66 (as modified by § 67.11) or the Technical Support Document or Instruction Manual. The decision shall be in writing. Notice and a copy of the decision, which shall constitute final administrative action by EPA pursuant to Section 120, shall be provided to the source owner or operator and to all other participants in the State hearing.

(d) If the Administrator finds that deficiencies in the State or local agent's hearing record prevent him from determining whether the State or local agent's determination conformed to the requirements of the Act and Part 66 (as modified by § 67.11) or the Technical Support Document or Instruction Manual, he shall notify the State or local agent of his decision and specify what dificiencies exist and schedule a hearing in accordance with Subpart F of Part 66. Such notice shall operate to withdraw EPA's dele-

gation of authority to the State or local agent over the facility in question unless the State or local agent within 15 days schedules a supplemental hearing to correct the deficiencies.

(e) Unless otherwise provided in the Administrator's notice to the State or local agent, any noncompliance penalties owed by the source owner or operator shall be paid to the State or local agent.

EDITORIAL NOTE: The Office of the Federal Register has received a letter from the Environmental Protection Agency indicating that certain portions of Appendices A and B, and all of Appendix C, published at 45 FR 50117, July 28, 1980, may be omitted from CFR publication.

The excerpts from the appendices appearing in this CFR volume contain the regulatory language and requirements of the Noncompliance Penalty program.

The EPA has determined that the omitted portions are not regulatory, and are either introductory text, reproductions of publicly available documents, or illustrative examples. The EPA has agreed to make copies of the computer program (Appendix C) available upon request from:

Director, Division of Stationary Source Enforcement
EN-341
401 M Street, S.W.
Washington, DC 20406

APPENDIX A—CLEAN AIR ACT, SECTION 120, NONCOMPLIANCE PENALTIES, TECHNICAL SUPPORT DOCUMENT

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SECTION IV—DEFINITIONS OF PARAMETERS AND SOURCES OF DATA

Calculation of the penalty requires estimates of a large number of financial parameters, many of which are specific to the noncomplying firm. This section contains definitions of these parameters and sources from which their numerical values are to be drawn.

1. Capital Investment Schedule

This schedule is an estimate of monthly expenditures to be made for purchase and installation of the required pollution control equipment. It includes not only direct purchase costs, including sales taxes, but also such expenditures as site preparation, engineering design, shipping costs, and installation expenses.

In the event that contracts have been signed for construction or purchase of the required equipment, they should be used as the basis for such costs. Other possble bases include engineering estimates, quotations from equipment manufacturers and, where no other data are available, reasonable estimates by the owner of the facility.

2. Operating and Maintenance Expense

This parameter is an estimate of the monthly cost of operating and maintaining the required pollution control equipment. That is, this amount should represent the average monthly operating and maintenance expense the firm would have incurred in the initial year of compliance. There is a provision in the formulation which automatically adjusts future months' operating and maintenance expense for anticipated inflation.

Losses in production capacity and incremental energy costs which will be incurred as a direct result of operating the pollution control equipment should be counted as an expense in this category. On the other hand, the value of any byproduct recovery resulting from such operating should be deducted. To the extent that these or other factors will result in the real cost of operating and maintenance varying over time, an estimated schedule of payments must be provided.

Sources of estimates for operating and maintenance expense include equipment manufacturers, engineering consultants and the owner of the facility. These estimates should include all recommended operating and maintenance procedures, training and planning costs, cost of warranties, recordkeeping and costs of monitors.

3. Investment Tax Credit

This credit is a reduction in federal or state income taxes payable as a result of making qualified capital investments. It is equal to a specified percentage of the portion of the initial capital costs which qualify under U.S. Internal Revenue Service (IRS) regulations. The investment tax credit is included in the formulation because it has the effect of reducing the cash outflow required

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to purchase the pollution control equipment.

The applicable percentage is given in the Internal Revenue Code as are the criteria for qualifying investments. Further details are provided in Attachment B.

4. Marginal Income Tax Rate

This rate is the fraction of the last dollar of taxable income which must be paid by the firm to federal, state and local governments. It is the amount by which taxes would increase if taxable income were to increase. It is different than the average income tax rate—total income tax divided by taxable income.

The tax rates of the various levels of government are specified by statute and depend on the level of taxable income reported by the owner of the polluting facility. A formula for computing the marginal income tax rate for a firm subject to income taxation by more than one level of government is given in Attachment D.

The noncompliance penalty is based on the incremental savings from delaying investment in pollution control equipment. The tax effects will depend on the rate applied to the incremental cash flows—the firm's marginal income tax rate.

An alternative to using the marginal income tax rate would be to use the average rate. The advantage of using such a rate is that it can be calculated directly from data contained in the firm's financial statements. However, the use of an average rate would not result in a correct computation of the tax consequences of an incremental investment. It was therefore rejected as the appropriate tax rate.

5. Inflation Rate

This is the annual rate at which both capital and operating and maintenance costs are expected to grow. These cost increases are the result of inflation in various factors such as labor, capital goods and energy.

For purposes of computing the noncompliance penalty, the annual compounded change in the *Chemical Engineering* Plant Cost Inflation Index for the most recent 60 months of data is to be used as an estimate of the future rate of increase in pollution control expenditures.[1] The *Chemical Engineering* Plant Cost Index is based on a weighted average of four cost components: (a) fabrication and equipment, (b) engineering and supervision, (c) construction labor, and (d) building costs. The weights are determined by a survey of the chemical industry made by *Chemical Engineering* magazine. the cost components are derived from the producer price indices compiled by the Bureau of Labor Statistics.

There is no widely available index of pollution control equipment costs as such. The *Chemical Engineering* index is based on factors which are clearly important components of such costs. The principle alternative considered was to use some broader and more universally recognized index, such as the GNP implicit price deflator. This was considered to be an inferior choice since it is based on a broad range of factors (food, housing, medical costs, and so forth) only loosely related to the cost of pollution control equipment.

A problem with using any historical index to project the future is that changing conditions may make the estimates inaccurate. Using an inflation rate over the past several years as an estimate of the future rate may appear to be an example of such a problem. Offsetting this problem to a great extent is the fact that a similar approach is being used for the discount rate. Since the inflation and discount rates act in opposite directions with respect to pollution control cash flows (that is, the inflation rate is used to increase future values while the discount rate is used to reduce them), any error introduced by using an historic inflation rate is counteracted by using an historic return on equity as the discount rate. Furthermore, both the discount rate and the inflation rate will be updated using more current information at the time of post-compliance settlement.

6. Discount Rate

This is the percentage rate to be used as the basis for discounting cash flows in future years. Such discounting is necessary to convert cash flows occurring in different years into present values. The source of the discount rate is the industry average return or the all-manufacturing average return on the net book value of common stockholders equity, whichever is higher. These rates are reported by the Federal Trade Commission in its *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations.*[2] They are based on an exhaustive sample of the firms in each industry and, subject to the limitations found in all accounting data, represent an accurate estimate of the past performance of U.S. industries. To smooth out year-to-year fluctuations, the discount rate used in computing the noncompliance penalty is the average of the most recent

[1] *Chemical Enginering,* McGraw-Hill, Inc., April 28, 1975 and subsequent issues. For the years 1972-1977 this rate was 8.3 percent.

[2] For public utilities, the return on equity data is found in the April issues of Citibank's *Monthly Economic Letter.* The utility return on net worth is to be used as the discount rate for utilities.

twenty quarters. However, as was discussed in Section III, a discount rate cannot be used that is lower than the inflation rate.

In theory, the appropriate rate to include in the formulae is the marginal rate of return on equity; that is, the rate which investors would require in order to commit additional common equity funding to the firm. The estimation of such a rate is difficult. One possible estimate of this rate is the internal "hurdle rate" which firms use to evaluate capital investments. This rate would automatically provide an insight into the firm's own estimate of the opportunity cost of additional equity capital. However, because a hurdle rate is not used internally by all firms, because it is often very subjectively determined, and because it would be administratively difficult to obtain, it was rejected as an estimate of the discount rate.

Another alternative means of estimating the discount rate is the expected future return on a share of the firm's common stock. Unfortunately, only the stocks of a small percentage of firms are publicly held and frequently traded and hence, have realistic share prices. Moreover, even is such prices exist, the expected return would have to be estimated. It is doubtful whether a satisfactory means could be found for providing these estimates. It is doubtful whether a satisfactory means could be found for providing these estimates.

Other estimates of the opportunity cost of equity funds based on economic and finance theory are available in the literature.[3] However, there currently exists no commonly accepted methodology for making such estimates and the cost of updating these estimates is prohibitive. Hence, these estimates were also rejected as a source of the discount rate. The use of either these theoretical estimates or the hurdle rate estimates would have resulted in higher penalties since these estimates tend to be higher than the average return on equity over the past five years.

The shortcomings of the methods described above have led to the selection of a return on equity which is based on book values. However, since the appropriate discount rate should reflect the expected earnings on the firm's current investment opportunities rather than its past investments, the higher of the industry average rate or the all-manufacturing average rate of return is used rather than a firm-specific rate. It is assumed that firms in industries which historically have earned more than the all manufacturing rate of return will continue to have investment opportunities available to them which will yield a higher than average rate of return. For firms in industries which have historically earned less than the all manufacturing rate of return, the all manufacturing rate of return is more indicative of the return on the future investment opportunities available to the firm.[4]

Certain consequences result from the use of industry average data rather than firm-specific data. If firm-specific data were employed, those firms with high historical returns would, all else being equal, pay higher penalties. Similarly, firms whose returns have been below industry average would pay lower penalties. Since the savings to a firm from delaying compliance is related to future returns on equity, the question becomes whether the future returns of a specific firm will best be estimated by its own past performance. The fact that individual firm performance is influenced by a variety of factors, often peculiar to the firm and not likely to be repeated, and that future returns are more closely related to the investment opportunities available to industry argues for the use of industry average data.

The use of an industry average rate or the all-manfacturing rate also eliminates the need to verify firm-specific rate of return calculations. Particularly in the case of small firms, the amount and timing of reported earnings could be significantly altered such that a rate of return computed on their book value would be meaningless. In the case of partnerships or sole proprietorships, it would be difficult to disentangle personal finances from company finances. The lack of sufficient resources to verify these data argue strongly for the use of an average rate.

7. Interest Rate

This is the current rate of interest which would be paid by the firm if additional debt were to be acquired. The interest rate is found by taking the average yield as published in Moody's *Bond Record* on corporate bonds of a grade equal to that on the firm's bonds having the highest rating.

If a firm's debt is not rated, the interest rate is found by using the current rate of interest on grade "A" corporate industrial bonds, published in the *Bond Record*. The current interest rate on grade "A" corporate

[3] See, for example, Gerald A. Pogue, *Estimation of the Cost of Capital for Major United States Industries with Application to Pollution Control Investments*, Environmental Protection Agency, EPA-230/3-76-001, November 1975.

[4] The industry average rate of return is employed as the discount rate for utilities, even if the all manufacturing rate is higher, since the investment opportunities available to utilities may be limited by federal or state law or public utility commission practice.

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bonds was chosen because it is a widely available figure which estimates the rates appropriate to a large percentage of firms. Since Moody's *Bond Record* does not provide average yields for bonds rated lower than "Baa", firms with debt rated "Baa" or lower will use the "Baa" rate of interest.

If the firm expects to use industrial development bonds (IDB's) to finance all or a portion of its investment in pollution control equipment, a weighted average of the corporate bond rate and the IDB rate[5] will be used as the interest rate in the model. The calculation of this weighted average is explained in the Attachment E.

8. Preferred Stock Dividend Rate

This is the rate which would be paid by the firm to its preferred stockholders on new issues of preferred stock. Like return on equity and the interest rate, the dividend rate on preferred stock represents the marginal cost of this component of long-term financing.

If a firm has preferred stock outstanding which has a rating, the preferred stock dividend rate is given by taking the average yield on public utility preferred stock[6] of that rating as reported in Moody's *Bond Record*. If the stock is not publicly traded or has no rating, the rate is found by using the current preferred stock yield on grade "a" issues. Since Moody's *Bond Record* does not provide average yields for preferred stock rated lower than "Baa" or higher than "aa", firms with stock rated "baa" or lower should use use the "baa" rate and firms with stocks rated "aa" or higher should use the "aa" rate.

9. Debt Share

This share is the proportion of long-term financing provided by long-term loans, bonds and other long-term interest-bearing instruments. It is a fraction, the numerator of which is the sum of all long-term debt accounts on the firm's balance sheet. The denominator of the fraction is the sum of these debt accounts plus preferred stock plus common equity investment.

The source of the fraction of debt is the share of debt in the firm's capital structure averaged over the five most recent years. The five year average is used to smooth out year-to-year fluctuations.[7]

10. Equity Share

This share is the proportion of the firm's long-term financing which is provided by common shareholders. It is a fraction, the numerator of which is the sum of all common equity accounts on the firm's balance sheet including common stock, retained earnings, capital surplus and any other accounts representing common equity investments.[8] The denominator of the fraction is given by adding to the numerator the sum of the preferred stock account plus all long-term debt issued by the owner (excluding portions of such debt in the current account).

The source of the fraction of equity in the investment is the average fraction of equity in the capital structure as given in the firm's five most recent annual financial statements.

11. Preferred Share

This share is the fraction of long-term financing provided by preferred stock. The numerator is given by the preferred stock accounts in the firm's balance sheet and the denominator by the quantity: long-term debt plus preferred stock plus common equity interest.

The source of the fraction of preferred stock in the investment is the average fraction of preferred stock in the capital structure as given in the firm's five most recent annual financial statements.

12. Depreciation

Computation of the noncompliance penalty involves consideration of the depreciation-related tax benefits of an investment in pollution control equipment. The firm may choose the method of depreciation to be used, subject to conformity with Internal Revenue Service guidelines. EPA's computer

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[5]The interest rate on IDB's is published by Smith, Barney, Harris Upham & Company in the *Bond Market Review*. This review is published weekly and the current yield on pollution control bonds is printed on the last page.

[6]Average yields are published only for public utility preferred stocks. Non-utility corporations, as well as utilities, should use these average yields if preferred stock is a part of their capital structure.

[7]If financial statements are unavailable, which may be the case for some privately-held firms, the fraction of debt and equity used in the penalty calculation will be the five year average debt and equity share for the firm's industry. This can be calculated from the financial statement provided for the industry by the Federal Trade Commission in its *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations*.

[8]Some firms carry Treasury stock as an asset on their balance sheet. Such stock should properly be shown as a contra-account to common stock. In cases where it is shown as an asset, it should be used to reduce the common equity accounts for purposes of this calculation.

program to calculate the penalty automatically selects the depreciation method which results in the minimum penalty. This is done under the assumption that the firm would use the depreciation method which resulted in the lowest possible cost of compliance, and hence, the lowest penalty.

The depreciation life is the minimum number of years over which a particular investment in pollution control equipment may be depreciated. The source of this figure is the lower limit on the asset depreciation range for the appropriate class of assets as given in the Internal Revenue Service publication *Revenue Procedure 77-10.* If the lower limit is greater than ten years, a ten year limit is used, consistent with the requirements of the Act.

13. Useful Life

The useful life of the pollution control equipment is the number of years it can be expected to operate before replacement.

The source of the useful life of the pollution control equipment is the asset guideline period for the appropriate class. These are provided by the Internal Revenue Service in *Revenue Procedure 77-10.* They represent IRS estimates of the average lives of assets within a particular industry. They were established after an exhaustive study of actual asset lives and will be updated as appropriate.

SECTION V—DERIVATION OF FORMULAE

Section II described the procedure used to determine the noncompliance penalty. This section follows the same general outline in deriving the formulae used to make the calculations. All symbols used in this section are defined in Attachment A. A complete description of the parameters used and their sources was given in Section IV.

POLLUTION CONTROL CASH FLOWS

To compute the savings from delaying pollution control investment requires that the cash flows be estimated over a thirty year fixed time horizon. The simplest approach to calculating the present value of the cash flows over thirty years is to calculate the present value of cash flows in the initial cycle of N months [9] and use that value as a basis for all other replacement cycles. The derivation described below uses such an approach.

Initial Cycle of Equipment

The first category is the cash flow resulting from the initial investment of equity. It is given by:

$$EI = II * Q \tag{1}$$

where:

II = the capital cost of the pollution control equipment.

Q = the fraction of the firm's capital structure made up of equity.

From this amount must be subtracted the effect of the investment tax credit whose cash flow is given by:

$$ITC = II * t_{ITC} \tag{2}$$

where:

t_{ITC} = the adjusted investment tax credit rate.

The investment tax credit rate must be adjusted if not all of the investment qualifies for the credit. This adjustment is explained in Attachment B. Further, if the investment is financed with industrial development bonds and rapid amortization is selected (see Attachment C), only one-half of the normal investment tax credit is allowed on that portion of the investment so financed.

The initial cash flow at the beginning of the cycle is found by subtracting equation (2) from equation (1):

$$\begin{aligned} INITIAL_0 &= EI - ITC \\ &= II * Q - II * t_{ITC} \\ &= II * (Q - t_{ITC}) \end{aligned} \tag{3}$$

The cash flow occurs at the beginning of the first cycle—at the end of month 0. The initial cash flow in the remaining months of the first cycle is zero. ($INITIAL_m = 0$ for m not equal to 0.)

The second category of cash flow is the capital-related flow which occurs over the depreciable life of the equipment. It is made up of depreciation and the flows associated with financing the equipment. The effect of depreciation is to reduce the firm's tax liability. The depreciation cash flow in month m is given by:

[9] N represents the useful life of the pollution control equipment in months.

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$$DEP_m = II * d_m * t_{TR} \quad (4)$$

where:

d_m = the fraction of the original cost depreciated in month m (see Attachment C).

t_{TR} = the firm's marginal income tax rate (see Attachment D).

As the equipment is depreciated, the book value of the equipment declines. The book value of the equipment at the beginning of month m is given by: [10]

$$(BOOK\ VALUE)_m = II * (1 - \sum_{k=0}^{m-1} d_k) \quad (5)$$

where:

$d_o = 0$ by definition

The remainder of the annual capital-related cash flow consists of principal repayments and financing charges (i.e., interest and dividends) on the debt and preferred stock issued to finance the equipment purchase. The amount of the initial investment financed by debt is given by:

$$DEBT\ SHARE = II * B \quad (6)$$

where:

B = the fraction of the firm's capital made up of debt.

Debt is repaid each month in proportion to the depreciation of the asset. That is, at the end of each month the same fraction of the principal is repaid as the original book value of the investment is depreciated.[11] Therefore, the repayment of principal in month m is given by:

$$PRIN_m = d_m * II * B \quad (7)$$

Interest is paid at the end of each month on the principal outstanding at the beginning of month m.

$$(INTEREST\ CHARGE)_m = R_{INT} * (PRINCIPAL\ OUTSTANDING)_m \quad (8)$$

where:

R_{INT} = the firm's monthly interest rate (expressed as a decimal fraction).[12] See Attachment E.

Since interest is tax deductible, only the after-tax effects should be considered in calculating the cash flow. Therefore, the interest payment net cash flow in month m becomes:

$$INT_m = R_{INT} * (PRINCIPAL\ OUTSTANDING)_m * (1 - t_{TR}) \quad (9)$$

The principal outstanding is the original amount borrowed, II * B, less the amount which has been repaid prior to the beginning of the month. The amount repaid prior to the beginning of month m is:

$$(AMOUNT\ REPAID)_m = \sum_{k=0}^{m-1} II * d_k * B \quad (10)$$

[10] The declining book value does not in itself represent a cash flow. This equation is included here to simplify the calculation of the remaining book value of the equipment at the end of the thirty year time horizon which occurs later in this chapter.

[11] A variety of assumptions could be made concerning the debt repayment schedule. The formulae assume that debt is repaid over the depreciation life of the equipment. This assumption is made in order to hold constant the capital structure of the firm over the time horizon.

[12] The monthly interest rate, R_{INT}, equals $(1 + R)^{1/12} - 1$, where R is the annual interest rate paid by the firm on new issues of debt.

where:

$d_o = 0$ as before.

The principal outstanding at the beginning of month m is the amount initially borrowed less the amount repaid by the end of month m – 1.

$$(\text{PRINCIPAL OUTSTANDING})_m = II * B - \sum_{k=0}^{m-1} II * d_k * B \quad (11)$$

Combining equations (9) and (11) yields a formula for the interest-related cash flow in year month m:

$$INT_m = R_{INT} * II * B * (1-t_{TR}) * (1 - \sum_{k=0}^{m-1} d_k) \quad (12)$$

The portion of the investment financed by preferred stock is given by:

$$\text{PREFERRED SHARE} = II * F \quad (13)$$

where:

F = the fraction of preferred in the firm's capital structure.[13]

Just as the additional debt is repaid, the preferred stock is redeemed as the asset is depreciated. At the end of each month, the same fraction of the preferred stock is redeemed as the original book value of the investment is depreciated. Redemption in month m is given by:

$$PREF_m = d_m * II * F \quad (14)$$

Dividends on preferred stock are paid at the end of each month on the amount of stock outstanding at the beginning of the month.

$$DIV_m = R_{DIV} * (\text{PREFERRED OUTSTANDING})_m \quad (15)$$

where:

R_{DIV} = the monthly dividend rate on preferred stock (expressed as a decimal fraction).[14]

These dividends are not tax deductible. The preferred outstanding is the original amount issued, II * F, less the amount redeemed prior to the beginning of the month. The amount redeemed prior to month m is:

$$(\text{AMOUNT REDEEMED})_m = \sum_{k=0}^{m-1} II * d_k * F \quad (16)$$

where:

$d_o = 0$ as before.

[13]Note that Q + B + F must be equal to 1.

[14]The monthly dividend rate, R_{DIV}, equals $(1+R)^{1/12} - 1$, where R is the annual dividend rate paid by the firm on new issues of preferred stock.

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The amount of preferred outstanding at the beginning of month m is equal to the amount originally issued less the amount redeemed.

$$(\text{PREFERRED OUTSTANDING})_m = II * F - \sum_{k=0}^{m-1} II * d_k * F \quad (17)$$

The preferred dividend paid at the end of month m is found by combining equations (15) and (17).

$$DIV_m = R_{DIV} * II * F * (1 - \sum_{k=0}^{m-1} d_k) \quad (18)$$

Therefore, the total monthly capital-related charges for each month m of the initial cycle are:

$$\text{MONTHLY CAPITAL RELATED}_m = -DEP_m + PRIN_m + INT_m + PREF_m + DIV_m \quad (19)$$

The negative sign preceding the depreciation cash flow results from the fact that this component represents a reduction in cash outflow. These monthly capital-related cash flows will occur over the depreciable life of the equipment. After the equipment is fully depreciated, these cash flows will be zero until the next cycle of equipment is installed.

The final category of cash flow is that associated with monthly operating and maintenance expenditures. These expenses grow each month at the monthly inflation rate. Like interest and dividend payments, they are assumed to be paid at the end of the month. They are tax deductible so their associated cash flows must reflect the effect of income taxes. Let $O\&M_m$ be the cash flow resulting from operating and maintenance expense in month m. Define M_0 as the monthly operating and maintenance expense before tax stated in current dollars as of the beginning of the period of noncompliance. The first payment actually made will be this amount escalated by the monthly inflation rate. The resulting cash flow is given by:

$$O\&M_1 = M_0 * (1 - t_{TR}) * (1 + i)$$
$$O\&M_2 = O\&M_1 * (1 + i) = M_0 * (1 - t_{TR}) * (1 + i)^2$$
$$O\&M_3 = O\&M_2 * (1 + i) = M_0 * (1 - t_{TR}) * (1 + i)^3 \quad (20)$$

where:

i = the monthly inflation rate.[15]

In general, the monthly O&M expense in month m is:

$$O\&M_m = M_0 * (1 - t_{TR}) * (1 + i)^m \quad (21)$$

Future Cycles of Equipment

It is now necessary to expand these calculations to include the value of any future replacement cycles which occur in the thirty-year time horizon. This can be accomplished by recognizing that the costs incurred in any given future cycle are identical to those incurred in the corresponding year of the original cycle except that the costs have increased by the inflation rate.[16] For example, the replacement of equipment after N months, when the original equipment wears out, gives rise to an initial equity investment equal to:

[15] The inflation rate will normally be given in annual terms. If "A" is an annual rate, its monthly equivalent "a" is given by: $a = (1 + A)^{1/12} - 1$.

[16] This assumption does not necessarily assume that equipment in future cycles is identical to that of the initial cycle, but does assume that costs are identical (except for inflation).

$$INITIAL_N = INITIAL_0 * (1 + i)^N$$

In general, the initial equity investment at the end of month m will be equal to the investment made N months ago inflated at a monthly inflation rate, 1. The initial capital expense at the end of month m is, therefore, equal to:

$$INITIAL_m = INITIAL_{m-N} * (1 + i)^N$$

This can also be generalized as:

$$INITIAL_{(j-1)N} = INITIAL_0 * (1 + i)^{(j-1)N}$$

for the jth cycle.

In most months this value will be zero. Cash flows due to the initial investment at the beginning of a cycle will occur only in months O, N, 2N, 3N and so forth until the end of the thirty year (360 month) time horizon. If a cycle should end precisely at the end of the thirty year time horizon, it is assumed that the firm will not invest in replacement equipment at the end of the horizon. Thus, $INITIAL_{360}$ will always be zero.

Similarly, the monthly capital-related charges in month m will be:

$$\text{MONTHLY CAPITAL RELATED}_m = \text{MONTHLY CAPITAL RELATED}_{m-N} * (1 + i)^N$$

(23)

The monthly capital-related charges will occur in the first n months of each replacement cycle, where n is the depreciation life of the equipment in months. In all other months, the value of these cash flows will be zero.

And, finally, the monthly O&M expense in month m will be:

$$O\&M_m = O\&M_{m-N} * (1 + i)^N$$

(24)

The monthly cash flow for each month m is the sum of these three values.

$$MCF_m = INITIAL_m + \text{MONTHLY CAPITAL RELATED}_m + O\&M_m$$

(25)

These cash flows can be calculated for each of the 360 months in the planning horizon.

Salvage Value of Equipment at End of Time Horizon

At the end of the thirty year time horizon the cash flows cease. However, the firm realizes tax benefits from the deduction of any remaining depreciation and must repay all outstanding debt and preferred stock. The salvage value of the equipment will be zero because it is assumed that technological or regulatory change will render the equipment obsolete at the end of the time horizon.

The additional depreciation cash flow in the final month is the tax shield from a writeoff of the remaining book value of the equipment. The book value of the equipment at the beginning of each month m is:

$$\text{BOOK VALUE}_m = (\text{BOOK VALUE})_{m-N} * (1 + i)^N$$

(26)

Therefore, the final tax writeoff in month 360 is:

$$DEP_{FINAL} = t_{TR} * \text{BOOK VALUE}_{360N} - DEP$$

(27)

The depreciation write-off equals the tax shield on the book value of the equipment at the beginning of month 360 less the tax shield from depreciation claimed in the month 360.

Similarly, the debt principal outstanding at the end of month 360 will be repaid. To estimate the principal outstanding at the end of month 360, the principal outstanding at the beginning of month m is estimated first:

$$(\text{PRINCIPAL OUTSTANDING})_m = (\text{PRINCIPAL OUTSTANDING})_{m-N} * (1 + i)^N$$

(28)

The final principal outstanding at the end of month 360 will be the principal outstanding at the beginning of month 360 less the principal repaid during month 360.

$$PRIN_{FINAL} = (\text{PRINCIPAL OUTSTANDING})_{360} - PRM$$

(29)

Finally, the outstanding preferred stock will be repaid at the end of month 360. The preferred stock outstanding at the beginning of month m is:

$$(\text{PREFERRED OUTSTANDING})_m = (\text{PREFERRED OUTSTANDING})_{m-N} * (1 + i)^N$$

(30)

The final preferred stock outstanding at the end of month 360 will be the preferred stock outstanding at the beginning of month 360 less the preferred stock repaid during month 360.

$$PREF_{FINAL} = (\text{PREFERRED OUTSTANDING})_{360} - PREF_{360}$$

(31)

The sum of these final cash flows which will occur at the end of the thirty year time horizon is:

$$CF_{FINAL} = -DEP_{FINAL} + PRIN_{FINAL} + PREF_{FINAL}$$

(32)

DISCOUNTING THE CASH FLOWS

The present value of the cash flows in each month will be:

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$$PV_{MCF_m} = \frac{MCF_m}{(1+e)^m} \quad (33)$$

where:
e = the monthly discount rate.[17]

The sum of the present value of the cash flows for each month plus the final cash flow incurred at the end of the time horizon represents the cost to the firm of on-time compliance.

$$PV_{PCE} = \sum_{m=0}^{360} PV_{MCF_m} + \frac{CF_{FINAL}}{(1+e)^{360}} = \sum_{m=0}^{360} \frac{MCF_m}{(1+e)^m} + \frac{CF_{FINAL}}{(1+e)^{360}} \quad (34)$$

THE VALUE OF DELAY

The quantity just calculated is the present value, as of the day on which compliance should have been achieved, of pollution control cash flows which the firm would have experienced had it not delayed. If compliance is delayed, the cash flows each month will be delayed and inflation will increase the magnitude of these cash flows. The cash flows which will be incurred each month m over the thirty year horizon if the firm delays L months will be:

$$MCF'_m = MCF'_{m-L} * (1+i)^L \text{ for } m > L \quad (35)$$

where:
i = the monthly inflation rate.
L = the number of months of delay.

Note that MCF'_m will equal zero for m less than or equal to L since during the period of delay no cash flows are incurred. As in the on-time compliance cash flow calculation, it is assumed that the firm will not install new equipment in the final month of the planning horizon.[18]

Also as in the on-time compliance calculation, any remaining book value may be written off in the final month of the horizon. The outstanding debt and preferred stock must also be repaid. This final cash flow is:

$$CF'_{FINAL_m} = [-t_{TR} * (BOOK\ VALUE)_{360-L} + DEP_{360-L} + (PRINCIPAL\ OUTSTANDING)_{360-L} - PRIN_{360-L} + (PREFERRED\ OUTSTANDING)_{360-L} - PREF_{360-L} * (1+i)^L \quad (36)$$

The present value of delay alternative is the sum of each of the cash flows in equations (35) and (36) discounted by the rate of return on equity:

[17] As stated in Chapter III, the discount rate cannot exceed the inflation rate. The monthly discount rate, e, is equal to $(1+E)^{1/12} - 1$, where E is the annual discount rate.

[18] Thus, if the cash flow in month 360 − L in the on-time compliance calculation has a non-zero initial capital component, this total cash flow should be adjusted by subtracting the initial capital component.

MCF_{360-L} = MONTHLY CAPITAL RELATED$_{360-L}$ + O&M$_{360-L}$

$$PV_{DELAY} = \sum_{m=0}^{360} \frac{MCF'_m}{(1+e)^m} + \frac{CF'_{FINAL}}{(1+e)^{360}}$$

$$= \sum_{m=0}^{360} \frac{MCF_{m-L}(1+i)^L}{(1+e)^m} + \frac{CF'_{FINAL}}{(1+e)^{360}} \quad (37)$$

The savings from delay is thus given by the difference between the present values of on-time compliance and delayed compliance:

$$SAVINGS = PV_{PCE} - PV_{DELAY} \quad (38)$$

The savings from delay has two components. The first is the value of forgone O&M expenditures. The O&M component of the savings is the present value of the forgone O&M expenditures during the period of delay.

$$SAVINGS_{O\&M} = \sum_{m=1}^{L} \frac{O\&M_m}{(1+e)^m} \quad (39)$$

The second component is the value of delaying all capital-related cash flows. The capital component of the savings is the remainder of savings.

$$SAVINGS_{CAP} = SAVINGS - SAVINGS_{O\&M} \quad (40)$$

CONVERSION OF SAVINGS INTO MONTHLY EQUIVALENTS

In order to convert the savings from noncompliance into a series of penalty payments, it is necessary to express savings as a series of equivalent monthly amounts.[19] This series, which will be referred to as the "savings equivalent," must have two attributes:

It must have the same present value as the cash flows which would have resulted from investment in and operation of the required pollution control equipment. When these amounts are translated into a penalty, this requirement is intended to insure that a firm which continues to delay its pollution control expenditures will not benefit by doing so.

The savings equivalents must escalate at the rate of inflation. If this requirement is not met, the early penalty payments overstate the savings to the firm while later payments understate it.

Let S_j be the savings equivalent at the beginning of month j.[20] The requirement that the series escalate with inflation implies that:

$$S_2 = S_1 * (1+i)$$
$$S_3 = S_2 * (1+i) = S_1 * (1+i)^2$$
$$S_j = S_{j-1} * (1+i) = S_1 * (1+i)^{j-1} \quad (41)$$

where:

i = the monthly inflation rate.

The present value of each of these terms is calculated by discounting:

$$PV_{S_j} = \frac{S_j}{(1+e)^{j-1}}$$

Combining with equation (41) yields:

$$PV_{S_j} = \frac{S_1 * (1+i)^{j-1}}{(1+e)^{j-1}}$$

[19] The final penalty payment will be made on a quarterly basis. However, in order to increase the accuracy of the penalty calculation, all adjustments to the economic savings are made on a monthly basis.

[20] It is assumed that penalties are paid at the beginning of each period in contrast to the cash flows which are assumed to occur at the end of each period.

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The present value of these L monthly savings equivalents must be equal to the savings from delay. Thus:

$$\text{SAVINGS} = \sum_{j=1}^{L} PV_{S_j}$$

$$= \sum_{j=1}^{L} S_1 * \left(\frac{1+i}{1+e}\right)^{j-1}$$

$$\text{or} \quad S_1 = \frac{\text{SAVINGS}}{\sum_{j=1}^{L} \left(\frac{1+i}{1+e}\right)^{j-1}} \tag{44}$$

This represents the first term in the series. All terms after the first month can be computed by multiplying S_1 by the quantity $(1+i)$ raised to the appropriate power. For example, the savings equivalent at the beginning of the k^{th} month would be:

$$S_k = S_1 * (1+i)^{k-1} \tag{45}$$

The present value of these monthly savings equivalents is equal to the present value of the costs avoided during the period of noncompliance.

THE EFFECT OF PRECOMPLIANCE EXPENDITURES

The series of savings equivalents just developed is based on the assumption that firm installing pollution control equipment will pay for it when installation is completed and operation begins. In fact, substantial precompliance expenditures will often be required before final installation is completed. In calling for the imposition of a noncompliance penalty, Congress explicitly required that these precompliance expenditures be accounted for in the penalty calculation. The adjustments needed to incorporate the effect of precompliance expenditures are described below. The procedure is begun by dividing the savings equivalent into its capital and its operating and maintenance components. The adjustment of the capital component of the penalty is described, followed by a description of the procedure for adjusting the operations and maintenance component of the penalty.

Adjustment of Capital Components

The method used to account for precompliance capital expenditures is to adjust the capital component of a month's savings equivalent by multiplying it by a factor representing the proportion of the capital investment which is still to be made prior to the beginning of that month.[21] For example, if one-third of the total investment will have been made *prior* to the fifth month, the adjusted capital component of the savings for the fifth month is equal to two-thirds (the fraction of the investment still to be made) of the savings equivalent.

The computational procedure starts by rewriting formula (44) using formulae (39) and (40). This gives:

$$S_1 = S_1^C + S_1^M \tag{46}$$

[21] Note that the capital expenditure credit includes only those payments made prior to the beginning of the month. The capital expenditure credit does not include expenditures made in the current month since cash flows are assumed to occur at the end of the month.Therefore, the firm was able to earn a return during the month on the current month's capital expenditure which it would not have earned if compliance had not been delayed. Hence, the firm's savings from delay in the current month should include this return.

where: $S_1^C = \frac{\text{SAVINGS}_{CAP}}{\text{SAVINGS}} * S_1$

$S_1^M = \frac{\text{SAVINGS}_{O\&M}}{\text{SAVINGS}} * S_1$

The superscript C refers to the capital component of the savings equivalent and M refers to operating and maintenance component. Equation (45) for the capital component can then be rewritten as:

$$S_k^C = S_1^C * (1+i)^{k-1} \quad (47)$$

Let A_k^C be the month k capital component adjusted for precompliance expenditures. That is, A_k^C is equal to S_k^C times a factor representing the fraction of the initial capital investment (II) which remains to be made. If X_k^C is the fraction of the initial investment which has been made prior to the beginning of month k,[22] then:

$$A_k^C = (1 - X_k^C) * S_k^C \quad (48)$$

Adjustment of Operation and Maintenance Component

The operating and maintenance component of the savings must be adjusted to a value which is net of any actual O&M expenditures made during the period of noncomplicance. The adjustment of the operating and maintenance component, A^M, is equal to the present value of the operating and maintenance component of the savings ($SAVINGS_{O \text{ and } M}$ as defined in equation (39)) less the present value of any precompliance O&M expenditures made during the period of noncompliance.[23] Thus:

$$A^M = \text{SAVINGS}_{O\&M} - \sum_{k=1}^{L} \frac{P_k^M}{(1+e)^k} \quad (49)$$

where: P_k^M = precompliance operating and maintenance expense incurred in month k of the noncompliance period.

where:

P_k^M = precompliance operating and maintenance expense incurred in month k of the noncompliance period.

CALCULATION OF QUARTERLY PENALTIES

The Act requires that the noncompliance penalty payments be made on a quarterly basis and that all payments be of equal value.The EPA interprets this requirement to mean equality in real rather than nominal terms. Consequently, the series of payments must increase with inflation. This can be done by converting the monthly values of the capital component of the savings computed above into their present value equivalent, adding the present value of the O&M component of the savings, and then converting that present value into a new series of escalating quarterly payments. Let L be the number of months which compliance is delayed. Then the present value is given by:

$$PV_{\substack{\text{ADJUSTED} \\ \text{SERIES}}} = A^M + \sum_{k=1}^{L} \frac{A_k^C}{(1+e)^{k-1}} \quad (50)$$

[22] Note that X_k^C has a value between 0 and 1.

[23] If this calculation should result in an adjusted O&M penalty less than zero the present value of the adjusted O&M penalty, A^M, shall be set equal to zero. The firm will not be allowed to offset any portion of the capital component of its penalty with precompliance O&M expenses.

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The series of escalating payments must have this same present value.[24] Thus, if P_q is the payment to be made at the beginning of quarter q, the following equality must exist:

$$A^M + \sum_{k=1}^{L} \frac{A_k^C}{(1+e)^{k-1}} = P_1 + \frac{P_2}{(1+e')} + \ldots + \frac{P_T}{(1+e')^{T-1}} \quad (51)$$

where:

e' the quarterly equivalent discount rate.[25]

T the number of quarterly payments.

However, since $P_q = P_{q-1} * (1 + i)$

$$A^M + \sum_{k=1}^{L} \frac{A_k^C}{(1+e)^{k-1}} = P_1 * \sum_{q=1}^{T} \left(\frac{1+i'}{1+e'}\right)^{q-1}$$

where:

i the quarterly equivalent inflation rate.[26]

$$\text{or} \qquad P_1 = \frac{A^M + \sum_{k=1}^{L} \frac{A_k^C}{(1+e)^{k-1}}}{\sum_{q=1}^{T} \left(\frac{1+i'}{1+e'}\right)^{q-1}} \quad (52)$$

$$\text{and} \qquad P_q = P_{q-1} * (1+i') = P_1 * (1+i')^{q-1} \quad (53)$$

These payments have the following properties:

They are equal in real terms.

Their present value is equal to the present value of savings after adjustments for pre-compliance capital and operating and maintenance expenditures.

If either the assumed schedule of expenditures for compliance, the amounts of those expenditures, or the compliance date are inaccurate, the payments must be revised. This is discussed below.

POSTCOMPLIANCE SETTLEMENT

The original penalty computation is based on the costs which the firm would have experienced had compliance not been delayed. If compliance is delayed, inflation will result in the actual expenditures being somewhat larger. This inflation-induced variation is al-

[24]The number of required quarterly payments is determined from the months out of compliance using the formula:

T = Integer [(L + 2)/3]

where: Integer = the closest integer less than or equal to the nuunber in the brackets.

L = number of months out of compliance.

[25]The quarterly equivalent discount and inflation rate is found by taking the monthly equivalent discount and inflation rate to the third power. Thus:

$$e' = (1+e)^3 - 1$$
$$i' = (1+i)^3 - 1$$

where: e = monthly equivalent discount rate.
i = monthly equivalent inflation rate.

[26]See footnote 25.

ready accounted for in the formulation described above. However, simple estimation error may also contribute to the difference and it is this error that the post-compliance settlement is intended to remedy.

The method involves recomputing the penalty using revised estimates of capital costs and operating and maintenance costs, and revised estimates of the discount rate, and inflation rate and the capital structure of the firm. These revised estimates are then used in conjunction with the actual schedule of precompliance expenditures to recalculate the penalty payments. The settlement is based on the difference between these payments and those actually paid.

The settlement amount is the cumulative overpayment or underpayment at the end of the noncompliance period plus interest on each month's outstanding balance (the cumulative overpayment or underpayment at the end of each month). The formula for computing the settlement payment is as follows: Let Δ_k be the difference between the penalty that was paid in month k and the amount which should have been paid in that month. Let δ_k be the cumulative overpayment or underpayment at the end of month k, including interest. Then:

$$\delta_1 = \Delta_1 * r \text{ and}$$
$$\delta_2 = (\Delta_2 + \delta_1) * r$$

In general

$$\delta_k = (\Delta_k \delta_{k-1}) * r$$

where:

δ_k = the cumulative overpayment or underpayment at the end of month k, including interest.

Δ_k = the difference between the penalty amount paid in month k and the penalty amount which is computed using the revised estimates.

r = the monthly equivalent rate of interest determined by the Secretary of the Treasury.[27]

[27]The Secretary of the Treasury will designate an annual rate of interest for overpayments and an annual rate of interest for underpayments. For underpayments, the Secretary of the Treasury has determined that the rate of interest will equal the discount rate. Therefore, for each month with a positive outstanding balance indicating a cumulative overpayment ($\Delta_k + \delta_k$, greater than zero), r will equal the monthly equivalent of the interest rate for overpayments. For each month with a negative outstanding balance indicating a cumulative underpayment ($\Delta_k + \delta_k$, less than zero), r will equal the monthly equivalent of the discount rate as revised in the post-compliance settlement.

The total post-compliance settlement as of the date of compliance is given by:

$$\delta = \delta_L \tag{55}$$

where:

δ = the total post-compliance settlement as of the date of compliance.

L = the total number of months of noncompliance.

δ_L = the cumulative overpayment or underpayment at the end of the noncompliance period, including interest.

The total post-compliance settlement as of the day of compliance is then adjusted to reflect delay in the actual settlement payment. The final settlement amount is:

$$Z = \delta * (1 + r)^D \tag{56}$$

where:

Z = the actual settlement to be paid (or refunded) on the day of the settlement.

δ = the total post-compliance settlement as of the date of compliance.

r = the monthly equivalent rate of interest specified by the Secretary of the Treasury.[28]

D = the number of months between the date of compliance and the actual settlement.

DELAYED PENALTY PAYMENTS

In general, any time a penalty payment (P) is delayed by k months, the actual payment should be equal to:

$$P * (1 + e)^k$$

For example, if the first penalty payment is not paid until six months after the notice of noncompliance has been received, the first and second quarterly payments will be delayed for six and three months, respectively. If this occurs, the penalty payment after an initial six-month delay is equal to:

$$P_1 * (1 + e)^6 + P_2 * (1 + e)^3 + P_3$$

Attachment A—Definition of Symbols

Note: All variables denoted with an asterisk (*) are expressed as decimal fractions in the formulae in Section V. In the Instruction Manual the user is instructed to enter some of these variables as percentages; that is, 10 percent as opposed to 010. The computer model then converts these percentages to decimal fractions for use in the model.

[28]The interest rate, r, will be the monthly equivalent of the interest rate for overpayments if δ is greater than zero. If δ is less than zero, r will equal the monthly equivalent of the discount rate as revised in the post-compliance settlement.

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A_k^C = the monthly equivalent of the capital component of savings adjusted for precompliance expenditures.

A^M = the O&M component of savings adjusted for precompliance expenditures.

B = the fraction of debt in the owner's capital structure (book value).*

b = the fraction of the investment financed by industrial development bonds and depreciated using rapid amortization.*

CF_{FINAL} = cash flow at end of thirty year time horizon if compliance is not delayed.

CF'_{FINAL} = cash flow at end of thirty year time horizon if compliance is delayed.

D = the number of months between the date of compliance and the payment of the post-compliance and the payment of the post compliance settlement.

DEP_m = the net after-tax cash flow in month m resulting from depreciation of the initial investment.

DEP_{FINAL} = tax shield from writeoff of remaining book value of the equipment at the end of the thirty year time horizon.

d_m = the fraction of original asset value depreciated in month m.*

D_j = the fraction of original asset value depreciated in year j.*

Δ_k = the difference between the penalty paid in month k and the amount computed using revised figures for capital and O&M costs.

DIV_m = the dividend payment in month m on the preferred stock used to finance the initial investment.

E = the discount rate.*

e = the monthly equivalent of the discount E.*

e' = the quarterly equivalent of the discount rate E.*

EI = the amount of cash provided by equity investors to finance the initial investment.

f = the fraction of the initial investment which is amortized on a straight line basis over five years.*

F = the fraction of preferred stock (at book value) in the owner's capital structure.*

G = the depreciation life of the pollution control equipment in years.

I = the annual rate of inflation for pollution control expenditures.*

i = the monthly equivalent of the annual inflation rate I.*

i' = the quarterly equivalent of the annual inflation rate I.*

IBD = the dollar value of industrial development bonds issued to finance the pollution control equipment.

INITIAL = initial equity investment at the beginning of a replacement cycle.

INT_m = the interest payment cash flow (after the effect of taxes) in month m on the debt used to finance the initial investment.

II_{qual} = amount of initial capital investment which qualifies for the investment tax credit.

II = the initial investment in pollution control equipment; the amount which will be capitalized on the books of the firm and amortized over the life of the equipment.

ITC = the dollar amount of the investment tax credit.

j,k,m = indices, usually indicating the year or month in which a cash flow occurs.

K = the number of owners of the firm.

L = the number of months the firm is expected to be out of compliance.

M_o = monthly operating and maintenance expense in current dollars as of the beginning of the period of noncompliance.

MCF_m = cash flow in month m if compliance is not delayed.

MCF'_m = cash flow in month m if compliance is delayed.

MONTHLY CAPITAL RELATED$_m$ = capital-related cash flows in month m.

N = the useful life of the pollution control equipment in months.

n = the depreciation life of the pollution control in months.

$O\&M_m$ = the net operating and maintenance cash flow in month m.

P_q = the penalty payment to be made at the beginning of quarter q.

P_k^M = the precompliance operating and maintenance expenditure incurred in month k.

PV = the present value of cash flow.

PV_{MCFm} = present value of cash flow occurring in month m.

PV_{PCE} = present value of all cash flows resulting from the purchase and operation of the original and all future replacement cycles of pollution control equipment over the thirty-year time horizon.

PV_{DELAY} = present value of the costs of the original and all future cycles of pollution control equipment if compliance is delayed, as of the day compliance should have been achieved.

$PREF_m$ = the repayment of reallocation of preferred stock in month m.

$PREF_{FINAL}$ = repayment of outstanding preferred stock at the end of the thirty year time horizon.

$PRIN_m$ = the repayment of reallocation of debt in month m.

$PRIN_{FINAL}$ = repayment of outstanding debt at the end of the thirty year time horizon.

q = index indicating the quarter in which penalty payment is made.
Q = the fraction of common equity (at book value) in the owner's capital structure.*
r = the monthly rate of interest to be paid on post-compliance settlement amounts.*
R_{BOND} = the monthly interest rate on corporate or public utility bonds.*
R_{DIV} = the monthly dividend rate on preferred stock.*
R_{IDB} = the monthly interest rate in industrial development bonds.*
R_{INT} = the monthly rate of interest on long-term debt.*
S_k = the monthly equivalent of savings.
S_k^C = the monthly equivalent of the capital component of savings.
S_k^M = the monthly equivalent of the O&M component of savings.
SAVINGS = savings from delaying compliance.
$SAVINGS_{O \text{ and } M}$ = savings from forgone O&M expenditures during period of delay.
$SAVINGS_{CAP}$ = savings from delaying capital-related cash flows.
T = the number of quarterly payments.
t_{FEB} = the marginal federal income tax rate.*
t_{ITC} = the adjusted investment tax credit rate.*
t_L = the marginal local income tax rate.*
t_S = the marginal state income tax rate.*
$t_{S \text{ and } L}$ = the marginal state and local income tax rate.*
t_{TR} = the marginal income tax rate.*
W_j = the fraction of common stock held by stockholder j.*
X_k^C = the fraction of the capital investment which has been made prior to the beginning of month k.*
X^M = the portion of the total operating and maintenance expense incurred during the period of noncompliance at a replacement source.*
Y = the statutory investment tax credit rate.*
Z = the actual post-compliance settlement to be paid or refunded.
S_k = the cumulative overpayment or underpayment of the of the penalty at the end of month k, including interest.
S = the total post-compliance settlement as of the date of compliance.

Attachment B—Investment Tax Credit Qualification

Only certain assets qualify for the investment tax credit. Most buildings are among the assets that do not qualify.[29] If the installation of pollution control equipment involves expenditures which will be capitalized and amortized over the tax life of the equipment, but which do not qualify for the investment tax credit, then the calculation of the credit must be adjusted.

Let II_{qual} be the investment which qualifies for the investment tax credit and let II be the total investment. If the investment t credit rate and specified in the Intern Revenue Code is Y, and adjusted rate for use in the noncompliance penalty calculation is:

$$t_{ITC} = \frac{II_{qual}}{II} * Y$$

A further adjustment must be made if the investment is financed by the sale of tax-exempt industrial development bonds. If rapid amortization is used, only one-half of the credit can be taken on the investment. Investment projects partially financed by industrial development bonds and using rapid amortization receive an investment tax credit weighted to reflect the loss of one-half of the credit on the portion paid for by bonds. This is shown below:

$$t_{ITC} = \left(1 - \frac{b}{2}\right) * Y$$

where:
t_{ITC} = the adjusted investment tax credit rate.
b = the proportion of the investment financed by industrial development bonds and using rapid amortization.
Y = the investment tax credit rate specified in the Internal Revenue Code.

State investment tax credits should also be included in the investment tax credit rate. For example, Connecticut provides an investment tax credit for plants built in distressed areas. This tax credit lowers state taxes. Because state taxes are deductible from Federal taxes, only a portion of the credit benefits the firm. The total investment tax credit rate in states where the credit is based on actual investment is given by:

$$t_{ITC} = t_{ITC\,FEDERAL} + [(1 - t_{TR\,FEDERAL}) * t_{ITC\,STATE}]$$

where:

[29] The Revenue Act of 1978 allows use of the investment tax credit for rehabilitation expenditures in connection with business and productive structures in use at least twenty years since first placed in service or since the last qualifying rehabilitation.

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t_{ITC} = the adjusted investment tax credit rate.

$t_{ITC\,FEDERAL}$ = the adjusted Federal investment tax credit rate.

$t_{TR\,FEDERAL}$ = the marginal Federal income tax rate.

$t_{ITC\,STATE}$ = the adjusted State investment tax credit rate.

ATTACHMENT C—DEPRECIATION

The cash flow resulting from depreciation is given by:

$$DEP_m = d_m * II * t_{TR}$$

where d_m is the fraction of the original cost depreciated in month m and t_{TR} is the original income tax rate. The value of d_m will depend on the method of depreciation used by the owner of the facility. Formulae for deriving the fraction of the original cost depreciated in year j (D_j) are presented for the more common methods. The fraction of the original cost depreciated in month m, d_m, will be one-twelfth of the annual amount under each of these methods.

STRAIGHT LINE

Under this method, depreciation is the same during each year of the equipment's tax life (G).

$$D_j = 1/G$$

where:

G = the depreciation life of the pollution control equipment in years.

SUM OF YEARS DIGITS

Under this method, depreciation in year j is given by:

$$D_j = \frac{2 * (G-j+1)}{G * (G+1)}$$

DOUBLE DECLINING BALANCE

Under this method, depreciation in any year is the product of the remaining book value and twice the straight line rate. Switching to the straight line method is permitted after part of the asset has been depreciated. This switch, properly timed, increases the present value of the depreciation tax shield. The formula for double declining balance depreciation in year j is:

$$D_j = \max \begin{cases} \frac{2}{G} * \left(1 - \sum_{k=0}^{j-1} D_k\right) \\ \\ \frac{1}{G-j+1} * \left(1 - \sum_{k=0}^{j-1} D_k\right) \end{cases}$$

where "max" means that the greater of the two quantities to the right of the bracket should be chosen.

RAPID AMORTIZATION

A firm generally employs a depreciation method which minimizes the present value of its future income tax liability. This is accomplished by using the so-called accelerated depreciation methods, the most common of which are described above. Special rules governing the depreciation of pollution control equipment allow even faster writeoffs than the accelerated methods, often resulting in still greater reductions in the present value of future tax liability. This approach, known as rapid amortization, was provided for in the Tax Reform Act of 1976.

The rules for rapid amortization are as follows:

Divide the investment into two parts: (1) the amount which would be depriciated during the first 15 years under straight line depreciation, and (2) the residual.

The first part may be depreciated on a straight line basis over 5 years.

The second part may be depreciated over the full tax life of the investment using whichever depreciation method the owner chooses.

The formula for the fraction depreciated in year j is most easily developed by considering the two parts separately. The fraction in year j for the first part is given by:

$$D^1_j = \begin{cases} \frac{1}{5} * f, & \text{if } j \leq 5 \\ 0, & \text{if } j > 5 \end{cases}$$

where: $f = \min \begin{cases} \frac{15}{G} \\ 1 \end{cases}$

The fraction of the second part depreciated in year j is given by the formula for straight line, sum of years digits, or double-declining balance, depending on the method

used. This must be multiplied by (1 – f), the fraction of the initial investment in the second part.

$D_j^2 = (1 - f) *$ (standard fraction based on depreciation method)

The total depreciation fraction for year j under rapid amortization is then given by summing the two components:

$$D_j = D_j^1 + D_j^2$$

Attachment D—Tax Rate Adjustments

The calculation of the savings from noncompliance requires use of the firm's marginal income tax rate. For most large corporations operating in states with no state income tax, this figure would be 46 percent.[30] However, a state income tax or a noncorporate form of organization complicates the matter. This appendix discusses the adjustments necessary to deal with these two factors.

STATE AND LOCAL INCOME TAXES

Firms in some locations are subject to income taxation by more than one level of government. If state and local income taxes are deductible on the federal return, the rate of taxation on income, t_{TR}, must be computed according to the following procedure:

Let t_{FED} be the federal marginal tax rate and $t_{S \text{ and } L}$ be the rate on state and local returns. Taxes paid to state and local governments are deductible expenses on the federal return. Hence, this after-tax rate is given by:

$$t_{S \text{ and } L} * (1 - t_{FED})$$

The overall tax rate is the sum of federal and state and local effects. It is given by:

$$t_{TR} = t_{FED} + [T_{S \text{ and } L} * (1 - t_{FED})]$$

It is possible that certain local income taxes will be allowed as deductions when state income taxes are computed. In such cases, $t_{S \text{ and } L}$ is given by:

$$t_{S \text{ and } L} = t_S + t_L * (1 - t_S)$$

where:

t_S = the marginal state income tax rate.
t_L = the marginal local income tax rate.

If the local income tax is not deductible from the state, the combined rate is given by:

$$t_{S \text{ and } L} = t_S + t_L$$

MULTIPLE OWNERSHIP, PARTNERSHIPS AND SOLE PROPRIETORSHIPS

The assumption in employing the tax rate, t_{TR}, and its components, t_{FED} and $t_{S \text{ and } L}$, is that these rates represent the marginal income tax rates applicable to the owning firm. If there is more than one owner, as might be the case if the firm were a partnership or a Subchapter S corporation, the rate used in the noncompliance penalty should be a weighted average of the rates appropriate to each owner. In the case of sole proprietorships, the tax rate will be the marginal income tax rate applicable to the individual owner.

The formula for either t_{FED} or $t_{S \text{ and } L}$ would then be given by:

$$t = W_1 t_1 + W_2 t_2 + \ldots + W_k t_k = \sum_{k=1}^{K} W_k t_k$$

where:

t = the weighted average marginal income tax rate.
W_k = the fraction owned by the k^{th} owner.
t_k = the marginal income tax rate of the k^{th} owner.
K = the number of owners.

Attachment E—Weighted Average Interest Rate

The interest rate used in the formulae is the marginal rate of interest which would be paid by the firm if additional debt were acquired. If Industrial Development Bonds (IDB's) are not used, this rate is simply the most recent average yield on corporate bonds of a grade equal to that on the firm's bonds having the highest rating. If the firm expects to use IDB's to finance all or a portion of its investment in pollution control equipment, a weighted average of the corporate (or public utility) bond rate and IDB rate will be used as the interest rate in the model.

The weighted average interest rate will equal:

$R_{INT} = IDB/B * II * R_{IDB} + (1 - IDB/b * II) * R_{BOND}$ for $IDB \leq B * II$

where:

R_{INT} = the monthly weighted average interest rate (expressed a decimal fraction).
IDB = the dollar value of issued industrial development bonds.
B*II = the amount of the initial investment financed by debt.
R_{IDB} = the monthly equivalent of the interest rate on industrial development bonds (expressed as a decimal fraction).
R_{BOND} = the monthly equivalent of the interest rate on corporate or public utility bonds (expressed as a decimal fraction).

[30] As of January 1979.

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If the dollar value of industrial development bonds issued to finance the pollution control equipment exceeds the amount of the initial investment, the interest rate used in the formulae will be set equal to the interest rate on industrial development bonds. Thus:

$$R_{INT} = R_{IDB} \text{ for IDB} > B^{*}II$$

ATTACHMENT F—FACILITIES WITH LIMITED USEFUL LIVES

In some cases, a noncomplyance source of emissions will not be brought into compliance but instead will be retired or replaced by a complying source. For example, a steel company with a noncomplying open hearth furnace may wish to retire that furnace rather than bring it into compliance, and may replace its steelmaking capability with a basic oxygen furnace. The basic oxygen furnace would have sufficient emission controls to allow it to meet the standards for new sources.

If the firm wishes to operate a noncomplying source for a limited period of time and then retire that source, the noncomplying penalty is calculated based on the capital and operating and maintenance costs which *would have been incurred* in bringing the source into compliance. These are the costs which are foregone in continuing to operate the noncomplying source and are the basis of the savings which accrue to the owner in so doing. Since the source is never brought into compliance, there are no precompliance expenditures. The full capital cost of compliance is assumed to be incurred in the final month before retirement.

When the firm plans to replace a noncomplying source with a new facility after some period of noncompliance, a similar approach is used. The basic calculation is based on the costs that would have been incurred in bringing the older source into compliance. However, an adjustment is then made for the precompliance expenditures made on the *new* complying facility. In other words, expenditures made on the construction of the new source are used to adjust the penalty much the same as precompliance expenditures on the older source would be used if they occurred. This procedure is explained below.

The basic equations utilized in the consideration of precompliance expenditures were detailed in Section V. These equations begin by breaking the savings equivalent into its capital and operating and maintenance components. The capital component is then adjusted for precompliance expenditures as shown in equation (48):

$$A_k^C = (1 - X_k^C) * S_k^C \quad (48)$$

where:

A_k^C = adjusted capital component in month k

X_k^C = fraction of total capital investment made prior to the beginning of month k

S_k^C = unadjusted capital component in month k

In the case of a firm replacing an older noncomplying facility with a new source which meets the emission standards, the equation above would be used with X_k^C based on the total investment (for both productive capacity and pollution control equipment [31]) in the new facility and S_k^C based on the capital costs of bringing the old source into compliance. As such, X_k^C would represent the fraction of the *total* investment required for the new facility expended prior to the beginning of month k.[32]

The adjusted value of the operating and maintenance component—A^M—is equal to the amount which would have been spent at the old source in complying adjusted for the portion of the total operating and maintenance expenses of the equipment at the new source made during the period of noncompliance. The equation for adjusting operating and maintenance expenditures is written as:

$$AM = (1 - X^M) * SAVINGS_{O \text{ and } M} \quad (49)$$

where:

$_AM$ = adjusted operating and maintenance component of the penalty.

X^M = the present value of the operating and maintenance precompliance expenditures made during the period of noncompliance at the new source divided by the present value of the total operating and maintenance expense of the new source had it been in operation during the period of noncompliance.[33]

$SAVINGS_{O \text{ and } M}$ = the present value of the operating and maintenance expense of the old source had it been in compliance during the period of noncompliance; that is, the savings from forgone O&M expenditures during the period of delay.

As described above, noncompliance penalties for facilities with limited useful lives are based on the costs which would have been incurred in bringing the facility into compliance. Because the source is retired rather than brought into compliance, no

[31] Both production and pollution control expenditures are considered because in this case technology substitution itself as well as control equipment contribute to meeting the emission standards.

[32] The value of X_k^C cannot exceed one.

[33] The value of X^M cannot exceed one.

post-compliance settlement based on the capital and operating and maintenance costs actually incurred is possible. However, if the noncomplying source is replaced with a new facility, the noncompliance penalty is adjusted based on planned precompliance capital and operating and maintenance expenditures. In such cases, a post-compliance settlement is possible and necessary to adjust for differences between planned versus actual precompliance expenditures and the resulting alterations in the noncompliance penalty. The estimates of the discount rate, the inflation rate, and the firm's capital structure are also updated at the time. Such a settlement involves three steps:

The actual capital and operating and maintenance expenditures for each month are converted to dollars as of the date of noncompliance.

Each monthly constant dollar capital expenditure's percentage of the total capital expenditure is calculated. The percentage of the total operating and maintenance expenditures made during the period of noncompliance is also calculated.

The percentages of total capital expenditures and total operating and maintenance expenditures made during the period of noncompliance are used to adjust the respective penalty components computed in the initial penalty calculation.

The formulae are identical to those shown in Section V for the post-compliance settlement.

Attachment G—Application to Government Facilities

The noncompliance penalties described in this document are designed to remove the economic savings realized by a firm due to delayed compliance with pollution control requirements. Similar savings are realized by government-owned facilities—emission sources owned or under the control of municipal, state, federal and other government and quasi-government entities. The statute contemplates that noncompliance penalties will be assessed against such facilities as well.

The calculation of penalties for government facilities is carried out using the same general logic as presented in this document with two important changes:

1. Cash flows due to tax effects are no longer relevant.

2. A discount rate appropriate for use with government projects is used.

Each of these changes is described below.

Tax Effects

Because government facilities do not pay income taxes, cash flows which result from tax effects in the private sector are not included in the noncompliance formulae for government facilities. As a result, cash flows due to tax savings from depreciation, interest expense, and operating and maintenance expense are not included in the formulae for government noncompliance penalties. The replacement of t_{ITC} and t_{TR} with zero in all formulae developed in Section V will accomplish this change.

Discount Rate

The choice of a discount rate for use in analyzing government investments has been a widely debated subject for a number of years. One commonly held view is that the appropriate discount rate for evaluating government investments is the rate of return that the resources utilized would have provided in the private sector.[34] The correct discount rate is, therefore, the opportunity cost of funds in the private sector. This rate is extremely difficult to estimate since it involves calculating the weighted average of the rates of return in various productive sectors of the economy from which resources are withdrawn for the government investment under consideration.

For the purpose of noncompliance penalties, the discount rate of 10 percent specified by the Office of Management and Budget (OMB) for use in federal project analysis is utilized.[35] OMB argues that the discount rate of 10 percent represents an estimate of the average rate of return on private investment. This discount rate is often used by government, particularly in analysis of investments that will receive partial or full federal funding. Thus, use of this rate will insure that the calculation of noncompliance penalties for government facilities is accomplished on the basis consistent with the analysis of investments carried out by government decision makers.

All cash flows in the noncompliance formulae should be discounted using the 10 percent discount rate. In order to accomplish this using the formulae derived in Section V, the variables F (preferred stock share) and B (debt share) should be set equal to zero and the variable Q (the equity share) should be set equal to one. The variable E is redefined to be the government discount rate and should be set equal to 10 percent. These changes and those in the tax rate variables described above result in the following cash flow values for government facilities.

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[34] See, for example, William J. Baumol, "On the Discount Rate for Public Projects," *Public Expenditure & Policy Analysis*, Robert H. Haveman and Julius Margolis, eds., Rand McNally Publishing Company, 1977, pp. 161 79.

[35] OMB Circular A-94.

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$$INITIAL_0 = II*1 \quad (3)$$

$$MONTHLY\ CAPITAL\ RELATED_m = 0 \quad (19)$$

$$O\&M_m = M_0*(1+i)^m \quad (21)$$

Thus, the cash flows resulting from the purchase and operation of pollution control equipment each month for a government facility is the sum of these contributions:

$$MCF_m = INITIAL_m + OMB_m \quad (25a)$$

Equation (25a) can be substituted for equation (25) in the subsequent formulae derivation presented in Section V.

Discounting all the cash flows associated with noncompliance at the 10 percent discount rate is theoretically correct for government-funded projects. Some government-owned entities, however, may more closely resemble private corporations in the manner in which they raise and repay their capital. All government-owned entities will be treated in the manner described in Attachment G unless the source being considered demonstrates by providing appropriate data that either the debt-equity ratio or the discount rate or both is inappropriate and therefore that the exception provided by Attachment G should not apply to the entity in question.

Appendix B—Clean Air Act, Section 120, Noncompliance Penalties, Instruction Manual

CONTENTS

I. Introduction
II. Data Requirements and Data Sources
III. Using the Computer Program
IV. Calculation of the Post-Compliance Settlement
V. Special Conditions

Section I—Introduction

This appendix describes the procedures used to calculate the noncompliance penalty imposed by the 1977 amendments to the Clean Air Act (the Act). The penalty, stipulated under Section 120 of the Act, removes the economic benefits which accrue to a firm from delaying investment in pollution control.

The economic benefits of a delay in the installation of pollution control equipment has two components. First, the firm benefits by delaying the capital expenditure needed for pollution control. The firm can earn a return on the capital costs of the pollution control equipment whose purchase has been delayed. The second component of the economic benefit is the operating and maintenance costs avoided as a result of not having installed the equipment and the return on expenditures avoided.

IMPLEMENTING THE NONCOMPLIANCE PENALTY

A detailed discussion of the economic rationale for the noncompliance penalty and the computational method used is contained in Appendix A, the Technical Support Document. This appendix is designed to aid the user in determining the appropriate data for calculating the penalty and to describe the computer program which performs the actual computation.

To the extent practicable, the computer program has been written to accept data as it appears in the source. However, it is necessary in some instances to adjust the data for entry. When this adjustment requires several computations, a worksheet has been provided.

LEVEL OF KNOWLEDGE REQUIRED

The appendix has been written on the assumption that the user has had little formal training in business finance. Use of this manual and the computer program do not require a knowledge of the mathematical formulae in the Technical Support Document. It is assumed, however, that the reader is familiar with the discussion sections in the Technical Support Document.

PLAN OF THE DOCUMENT

Section II describes the sources of data needed to calculate the penalty and how the various data items are converted to a form suitable for entry into the computer program. As an aid in exposition, a hypothetical noncomplying firm is described and relevant penalty calculations are illustrated.

Section III describes the procedures necessary to operate the computer. An example of an actual use of the program to calculate a penalty is included. This example will utilize data calculated in Section II.

Section IV describes the calculation of the post-compliance settlement based on data used in Sections II and III.

Section V discusses the calculation of the penalty under special conditions. These conditions include investments financed with industrial development bonds, penalties for limited life facilities, and penalties for government facilities.

Section II—Data Requirements and Data Sources

Calculation of the noncompliance penalty requires a substantial amount of financial data. It is expected that most of this data, as well as the calculation itself, will be provided by the firm. This is in accordance with Section 120 of the Clean Air Act which will:

". . . require each person to whom is given under paragraph (3) to—

(A) calculate the amount of the penalty owed (determined in accordance with subsection (d)(2)) and the schedule of payments (determined in accordance with subsection (d)(3)) for each such source and, within forty-five days after the issuance of such notice or after the denial of a petition under subparagraph (B), to submit that calculation and proposed schedule, together with the information necessary for an independent verification thereof, to the State and to the Administrator."

However, some firms may not comply with the requirement. Section 120 further stipulates that if the firm fails to submit a calculation of the penalty, the State or the Administrator may contract with a third party to determine the penalty payments. This will require collection of data from several public sources. This section discusses the method used to collect data and prepare it for the calculation of the penalty.

CASE STUDY

As an aid to understanding the issues discussed in this and the next section, an example has been formulated involving a hypothetical fertilizer company. While this case will utilize data from an actual corporation, the firm is not in the fertilizer industry. The example was created to illustrate many of the features of the computer program and thus may be more complex than many "real life" situations. Data prepared in the case discussion below will be entered in the computer program to determine a penalty in Section III.

THE FERTILIZER COMPANY

On August 31, 1979, the Fertilizer Company was issued a notice of noncompliance with Section 120 of the Clean Air Act.[36] The source of emissions was an incinerator used for the disposal of a waste byproduct from the manufacture of the firm's most profitable product.

A preliminary engineering study had been performed in which it had been determined that compliance could be reached with an investment of $500,000. The investment would involve the purchase of a baghouse and modifications to the firm's incinerator in order to reduce particulate emissions.

In addition to the capital investment, it was estimated that $15,000 in operating and maintenance expense would be needed each year the pollution control equipment was operated. It was also estimated that $1,890 in precompliance maintenance expense was necessary to make the equipment operational.

Engineers for the Fertilizer Company believed that it would be at least nine months before the equipment was installed and shake-down was completed. Because the waste could be safely stored for short periods, production of fertilizer would not be interrupted while the incinerator was being modified.

The Fertilizer Company is a publicly-owned corporation with assets of $770 million. The company is mainly financed with investment by the common stockholders with some preferred stock and long term debt also exists.

The firm, in accordance with the Act, had computed the penalty owed and a schedule of payments. It had also submitted the data used in calculating the penalty. The enforcement official now had to arrange the data in the order it would be requested by the computer and verify that it was from an appropriate source. The computer program would check the accuracy of the firm's penalty calculation.

PREPARING DATA FOR ENTRY INTO THE PROGRAM

The computer program will request data in a specific sequence. Although the data submitted by the firm can be verified in any order, it is useful to verify the data in the same way so that omissions are avoided. The following paragraphs follow the same sequence as is used to enter data into the computer program.

Initial Penalty Calculation or Post-Compliance Settlement

The program can be used to calculate both the initial penalty when the notice of noncompliance is received and the post-compliance settlement after compliance has been achieved. In the example of the Fertilizer Company, the initial penalty will be calculated in Section III and the post-compliance settlement will be calculated in Section IV.

Limited Life Facility

The program calculates a penalty based on eventual compliance at the source. However, some firms will attain compliance by shutting down the source or by replacing it with a new source. This option is discussed in detail in Section V. For the Fertilizer Company, the source is not a limited life facility.

Industrial Development Bonds

The calculation of the percentage of a pollution control investment financed by tax-exempt industrial development bonds is dis-

[36] This example is for purposes of illustration only. In actuality, no notice of noncompliance will be issued prior to January 1, 1981.

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cussed in Section V. For the Fertilizer Company, none of the investment is financed by issuing tax-exempt bonds.

The Number of Months the Source Will Be Out of Compliance

The period of noncompliance is measured from the first day of the month following the month in which the notice of noncompliance is issued until the month standards are actually met. This will include installation time and shakedown period for the equipment. The firm is assumed to be in compliance during the entire month in which compliance is finally achieved. In the Fertilizer Company example, the firm stated that it will come into compliance in nine months.

Schedule of Capital Investments

This is an estimate, provided by the firm, of monthly capital expenditures for the purchase and installation of the pollution control equipment. It is assumed that all capital expenditures are completed when compliance is achieved.[17]

The sources which firms will use to estimate monthly expenditures include engineering estimates, quotations from manufacturers, or estimates by management. They will consist of not only the direct purchase cost, including sales taxes, but also site preparation, engineering design work, shipping costs and installation expense. In addition, the value of lost production due to downtime of production equipment should be included. These temporary losses of productive capacity are included in capital expenditures. Permanent losses of productive capacity are included in operating and maintenance expenditures. All costs must be stated in terms of the actual expenditures the firm expects to make each month.

The Fertilizer Company estimated that the total expenditure needed was $500,000. It submitted the data in Exhibit II-1 to justify the estimate. Expenditures to the manufacturer for the equipment will be made in three equal installments, during the second, fourth, and ninth months of noncompliance. Each payment will be $166,666.67 ($500,000 divided by 3).

[17] If a portion of the capital expenditures are expected to be incurred after compliance is achieved, these expenditures should be added to the capital expenditures made in the final month before compliance is achieved.

Schedule of Precompliance Operating and Maintenance Expenditures and Post-Compliance Monthly Operating and Maintenance Expense

These are costs the firm will incur for operation of the equipment to be installed.[18] They may include operating and supervisory labor, power for equipment operation, supplies necessary for operation and a portion of the firm's overhead. If a byproduct is created during equipment operation, disposal costs are included as an operating expense. If the byproduct can be sold or used in another process, the value of the byproduct should be subtracted from operating and maintenance expense.

EXHIBIT II-1—CALCULATION OF THE CAPITAL EXPENDITURE INPUT [1] FERTILIZER COMPANY

1. List price or estimated price of the equipment	$845,903.65
2. Less: Discount from manufacturer	9,718.17
3. Equals net price of equipment	476,190.48
4. Plus: Sales tax on equipment [2]	23,809.52
5. Plus: Freight and delivery charge	0
6. Plus: Installation charge	0
7. Equals estimated cost of equipment installed	$500,000.00
8. Plus: Value of lost production	0
9. Plus: Cost of building modifications	0
10. Equals total capital expenditure	$500,000.00

[1] This calculation uses Worksheet A in Attachment V.
[2] Some corporations subtract sales tax from revenue in the year of purchase. If this is the case, the sales tax is multiplied by (1 - Tax Rate) and subtracted from the cost of the equipment rather than added as in step four.
Note: Line 7 divided by line 10 is the percentage of qualified investment for calculation of the investment tax credit.

QUALIFIED PERCENTAGE INVESTMENT TAX CREDIT

$$\frac{\text{Line 7}}{\text{Line 10}} = \frac{\$500{,}000}{\$500{,}000} \times 10^{*} = 10\%$$

*If the depreciable life of the equipment is less than seven years, this figure must be adjusted as described on page II-16.

In addition, operating and maintenance should include the incremental cost of changing plant operations to conform to the Act. For example, a firm enforced to shift from high sulfur coal to low sulfur coal would include the increase in fuel costs as an operating expense. Operating expense would also include the additional cost incurred if compliance requires shifting pro-

[18] This should not include any operating and maintenance expenditures incurred in operating pollution control equipment installed prior to the date the notice of noncompliance is received.

duction to a less efficient or more expensive method. Hence, permanent losses in productive capacity which will be incurred as a direct result of operating the pollution control equipment should be counted as an expense in this category.

Sources for operating and maintenance expense are engineering reports, manufacturer specifications, estimates by owners or actual data from similar operations. Two different estimates of operating and maintenance expense are necessary—those incurred before compliance and those estimated for the period after compliance. These amounts should be stated as the actual expense the firm would expect to incur in each month before compliance and the average monthly expense which will be incurred after the firm comes into compliance.

The Fertilizer Company supplied the data in Exhibit II-2 as estimated precompliance operating and maintenance expense. For post-compliance operating and maintenance expense the Fertilizer Company supplied the data in Exhibit II-3.

EXHIBIT II-2—ESTIMATE OF MONTHLY PRECOMPLIANCE OPERATING AND MAINTENANCE EXPENSE FERTILIZER COMPANY

[Precompliance operating expense]

Months 1-6		$0
Month 7: Labor (10 hours at $10)	$100.00	$100.00
Month 8:		
Labor (100 hours at $10)	1,000.00	
Power (1500 kWh at .0333 kWh)	50.00	
Total		$1,050.00
Month 9:		
Labor (50 hours at $10)	500.00	
Power (7200 kWh at .0333 kWh)	240.00	
Total		$740.00

EXHIBIT II-3—POSTCOMPLIANCE ANNUAL OPERATING AND MAINTENANCE EXPENSE [1] FERTILIZER COMPANY

1. Annual labor expense: 840 hours × $10 per hour equals	$8,400.00
2. Power cost: 90090 kWh × $0.0333 per kWh equals	3,000.00
3. Water cost: Gallons × $ per gallon equals	0
4. Raw materials and supplies: 1000 lbs. × $1 per lb. equals	1,000.00
5. Yearly increase in property tax equals	3,000.00
6. Cost of production lost due to maintenance or use of equipment equals	0
7. Total cost (1 + 2 + 3 + 4 + 5 + 6) equals	$15,400.00
8. Less: Value of byproducts: 800 lbs. at $.50 per lb. equals	400.00
9. Annual operating and maintenance (7 − 8) equals	$15,000.00

EXHIBIT II-3—POSTCOMPLIANCE ANNUAL OPERATING AND MAINTENANCE EXPENSE [1] FERTILIZER COMPANY—Continued

10. Average monthly operating and maintenance (9 ÷ 12) equals	$1,250.00

[1] This calculation uses Worksheet B in Attachment V. All expenses should be stated in dollars as of the date the firm comes into compliance.

Investment Tax Credit Rate[39]

The investment tax credit is a percentage of the investment which can be used to directly reduce federal income tax. Although the federal tax credit for an investment is currently ten percent, this rate may have to be adjusted to reflect two restrictions in the revenue code: [40]

Investments of less than seven years do not receive the entire ten percent.

Certain investments do not qualify for the credit.

An investment with a depreciable life of less than seven years does not qualify for the maximum investment tax credit. Currently, percentages allowed for such investments are as follows:

Depreciable life (years)	Investment tax credit (percent)
Less than 3	0
At least 3 but less than 5	3.33
At least 5 but less than 7	6.67
7 or more	10.00

Items such as buildings and land are not usually allowable for purposes of computing the investment tax credit, so the percentage rate must be adjusted to yield a correct tax credit figure.[41] This adjustment is made by

[39] Information on the investment tax credit is contained in the Internal Revenue Service Code, Chapter 1, Subpart B—*Rules for Computing Credit for Investment in Certain Depreciable Property.*

[40] In addition to the two listed restrictions, investments financed with industrial development bonds qualify for only a portion of the credit when rapid amortization is used. This adjustment is made automatically by the computer program. Further, for the purposes of noncompliance penalties the entire investment tax credit as calculated is used regardless of the taxable income amount.

[41] The Revenue Act of 1978 allows an investment tax credit for rehabilitation expenditures in connection with business and

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calculating the percentage of the investment qualifying for the tax credit and multiplying it by the percentage tax credit for equipment of similar depreciable life.

State investment tax credits should also be included in the investment tax credit rate. For example, the State of Connecticut allows an investment tax credit to be applied against state taxes if the investment occurs in certain depressed areas. Because this credit reduces a tax deductible expense for federal income taxes, the credit must be adjusted to an after-tax basis. The adjustment is made by multiplying the state investment tax credit by one minus the marginal federal tax rate. The adjusted state credit is then added to the federal credit.[42]

For the Fertilizer Company, the entire investment qualifies for the investment tax credit. If $150,000 of the investment had not been qualified, only a seven percent credit would be allowed.[43]

If the Fertilizer Company had a depreciation tax life of five years and the entire investment qualified for the investment, only a 6.67 percent credit would be allowed.

Income Tax Rate

The income tax rate to be entered into the program must be the marginal rate—that is, the rate which the firm would pay on an additional dollar of income. The firm must estimate its marginal federal income tax rate and, where applicable, its marginal state and local tax rates. The state and local tax rates should not include sales tax, inventory tax, charter tax or taxes on property. If any of these taxes are material to the analysis, they should be included in either the investment or operating and maintenance expenditures, as appropriate. Sales tax has already been shown to increase investment while property taxes would be included in operating and maintenance expense.

In most cases involving large firms, the marginal tax rate will be 46 percent.[44] Small corporations and some partnerships or privately-owned firms could have lower rates. In many penalty calculations it will be necessary to adjust the state and local tax rates to reflect the fact that the state and local income taxes are also deductible from federal taxes. The steps for calculation are as follows.

The rate applicable to a firm is determined by the amount of taxable income expected in the next year. The ranges of taxable income and the corresponding marginal tax rate are shown below.

Taxable income	Marginal tax rate (percent)
$0 to $25,000	17
$25,000 to $50,000	20
$50,000 to $75,000	30
$75,000 to $100,000	40
$100,000 and above	46

The marginal federal, state and local income tax rates are determined.

The adjusted local tax rate given state taxes is computed.[45]

The local and state tax are adjusted for the federal tax.

The effective tax rate is computed.

Exhibit II-4 contains a calculation of the tax rate for the Fertilizer Company.

Inflation Rate

This is the estimated future increase in the capital and operating cost of pollution control equipment.[46] The inflation rate to be used in the Fertilizer Company penalty calculation is 7.2 percent. This was the compound annual rate of increase in the Chemical Engineering Plant Cost Inflation Index for the period July 1974 to July 1979.[47]

Footnote continued—
productive structures in use at least twenty years since first placed in service or since the last qualifying rehabilitation. Thus, the adjustment described above should be ignored for qualified rehabilitation investments.

[42]The formula for determining the investment tax credit in a state having a tax credit is:

$t_{ITC} = ITC_{FEDERAL} + (1 - \text{Tax Rate}_{FEDERAL}) * ITC_{STATE}$

[43]Computed as ($500,000-150,000)/500,000 × 10% = 7%

[44]As of January 1979. This rate must be adjusted for future changes in the tax laws.

[45]If the local tax is not deductible from the state tax, the numbers should be added.

[46]*Chemical Engineering*, McGraw Hill, Inc., April 28, 1975 and subsequent issues. The compound rate of increase is computed as:

[(Index in Final Month)/(Index in Initial Month)]$^{1/N} - 1 \times 100$

Where N equals the number of years between the first and last months.

[47]The inflation rate of 7.2 percent is only applicable to the example described in the manual. Actual penalty determination will require calculation of the inflation rate using the above formula and the Plant Cost Inflation Indices for the most recent month and the month five years prior to the most recent month.

EXHIBIT II-4—CALCULATION OF THE TAX RATE [1]
FERTILIZER COMPANY

[In percent]

1	Marginal Federal tax rate	46
2	Marginal State tax rate	5
3	Marginal local tax rate	2

[1] This calculation uses Worksheet C in Attachment V.

Calculation of Adjusted Local Tax

(1 − State tax rate) × local tax rate
= (1 − .05) × .02
= .95 × .02
= .019 = adjusted local tax rate

Calculation of Adjusted State and Local Tax

(1 − Federal tax rate) × (State tax rate + adjusted local rate)
= (1 − .46) × (.05 + .019)
= .54 × .069
= .073 = adjusted local and State tax

Calculation of Tax Rate

100 × (Federal tax rate + adjusted local and State tax)
= 100 × (.46 + .0373)
= 100 × .4973
= 49.73 = tax rate

Discount Rate

The discount rate is an estimate of the firm's cost of new equity capital. For a manufacturing firm, calculation of the discount rate requires averaging the twenty most recent quarters of the after-tax return on equity as reported for the firm's industry and for all manufacturing corporations in Table 4 of the Federal Trade Commission's *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations.* Attachment I contains a copy of Table 4 for the first quarter of 1979. The higher of the industry average rate of return on equity or the all-manufacturing rate of return on equity is used as the discount rate.

The annual rates of return on equity after taxes are reported by the FTC in broad industrial categories. To categorize a firm, the *Standard Industrial Classification Manual,* published by the Office of Management and Budget, should be used.[48]

The FTC does not report rates of return on equity for public utilities. For these organizations, the annual percent return on net worth published in the April *Monthly Economic Letter* by Citibank (New York) should be used as the discount rate. Attachment I includes a table listing this information for 1975 to 1979.

For the Fertilizer Company, the correct industrial category to use is Chemicals and Allied Products. The calculation of the average return on equity for twenty quarters is shown in Exhibit II-5. Since the 15.91 percent rate of return for chemicals and allied products exceeds the average rate of return of 13.99 percent for all manufacturing corporations, the discount rate used is 15.91 percent.

EXHIBIT II-5—FERTILIZER COMPANY, JULY 1978, AVERAGE RETURN ON EQUITY, CHEMICALS AND ALLIED PRODUCTS

Year	Quarter	Return on equity (percent)	
		Chemicals and allied products	All manufacturing
1974	2	21.3	16.7
	3	19.0	15.4
	4	14.8	13.2
1975	1	14.0	9.0
	2	16.1	11.8
	3	15.5	12.4
	4	15.2	13.1
1976	1	16.6	13.3
	2	17.2	15.7
	3	15.3	13.7
	4	12.8	13.1
1977	1	14.9	13.0
	2	16.8	16.0
	3	14.8	13.3
	4	13.8	14.4
1978	1	14.3	12.4
	2	16.7	16.6
	3	15.2	14.9
	4	16.3	16.1
1979	1	17.6	15.7
Total		318.2	279.8
Average		15.91	13.99

Interest Rate

The interest rate is the current cost of new debt for the firm.[49] Determination of the firm's interest rate requires two steps.

The quality rating for the firm's bonds is found in Moody's *Bond Record.* If the firm does not have rated debt, an "A" rating is assumed. If it has more than one issue, that with the higher rating is used.

The most recent yield reported for bonds of the same rating is found in the Corporate Bond Yield Averages section of the *Bond Record.*

[48] If the firm is a subsidiary of a larger corporation, the SIC category used should be the category appropriate for the smallest entity with audited financial statements which includes the source not in compliance.

[49] This discussion assumes that Industrial Development Bonds (IDB's) are not used. If IDB's are sold to finance the pollution control investment, see Section V.

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Bonds are rated by Moody's in a system ranging from a high of "Aaa" to a low of "C." The lowest average yield reported is "Baa;" a firm whose bonds have a rating of "Baa" or lower will use the yield reported for the "Baa" average. The bonds are listed in the *Bond Record* in alphabetical order by corporation. Convertible bonds are considered in the same manner as all other bonds.

Note that the interest rate is *not* taken from the so-called coupon rate on the bond. For example, in Exhibit II-6, rates of 9.75 percent and 4.5 percent are listed. These are historical rates which were in affect at the time the bonds were issued. They do not reflect current market rates.

The *Bond Record* reports a number of different yields. If the firm is a utility, the Public Utility Average is used. If the firm is not a utility, the Industrial Bond Average is used.

For the Fertilizer Company, the debt was not rated, so the most recent yield reported for the industrial "A" bonds is used (9.75%). Attachment II contains the average bond yields as reported in a recent issue of the *Bond Record.*

Preferred Dividend Rate

The method used for determining the preferred dividend rate is identical to that used to select the interest rate. The quality rating of the firm's preferred shares is found in Moody's *Bond Record* in the Preferred Stock section. If the stock is not rated, an "a" rating is assumed.

Average yields are reported for only "aa", "a", and "baa" preferred stocks issued by utiiities. However, these figures should be used for non-utility firms as well. If the stock has a rating of "baa" or lower, the firm should use the "baa" average yield. Firms with preferred stock rated "aa" or higher should use the "aa" yield. The latest month average is used and entered exactly as shown in the averages. Attachment III contains an example of the *Bond Record* preferred averages.

The Fertilizer Company's preferred stock is not rated so the yield entered for the penalty calculation is 9.60 percent, the rate found by using the return on "a" rated preferred stock.

Equity Share of Investment

This is the percentage amount of equity in the firm's capital structure. The capital structure of the firm is the dollar amount invested in the firm for periods over one year. Thus it does not include current liabilities or deferred federal income tax.

The equity share of the investment is calculated using data contained in the firm's five most recent annual reports.[50] The procedure involves the following steps:

Step 1. The sum of all the firm's equity accounts on each year's balance sheet is added to the total of its long term debt. This total represents the firm's long term financing or its capital structure for that year. It will include paid-in capital, retained earnings, capital surplus, preferred stock, and long term debt. If Treasury stock is shown as an *asset* on the balance sheet, it should be subtracted from the total capital.

Step 2. The dollar amount of all equity accounts except preferred stock shown in the equity section of the balance sheet for the year is divided by the total capital found in the previous step. This is the equity share of the investment for the year.

Step 3. The equity shares for each of the five most recent years are averaged to yield a equity share for input to the penalty calculation.

Preferred Stock Share of the Investment

The computation of the preferred stock share of the investment is analogous to the computation of the equity share of the investment, as described above. The sum of all preferred stock accounts is divided by the total capital computed in Step 1 above for each of the five most recent years. These figures are then averaged to yield a preferred stock share for input to the penalty calculation.

Debt Share of the Investment

The sum of all long-term debt accounts is the amount of debt in the capital structure each year. This sum is also divided by the

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[50]This is available either directly from the firm or, for large corporations, in *Moody's Industrial Manual.* An advantage to using Moody's is that the percent equity is reported and can be used as a check on the calculation.

If the firm does not have five years of annual reports, a shorter period of time may be used. For firms without audited financial statements, the fraction of preferred stock, debt, and equity used in the penalty calculation will be the five year average preferred stock, debt, and equity share for the firm's industry. This can be calculated from the financial statements provided for the industry by the Federal Trade Commission in this *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations.*

Firms which are subsidiaries of a larger corporation should use the financial statements of the smallest entity with audited financial statements which includes the source not in compliance.

yearly total capital found in Step 1 above yielding the debt share of the investment for the year. These figures are then averaged to yield a debt share for input to the penalty calculation.

The sum of the equity share, the debt share, and the preferred share of the investment must equal one hundred percent.

The balance sheet of the hypothetical Fertilizer Company is shown in Exhibit II-6. Exhibit II-7 illustrates the calculation of the equity, preferred stock, and debt share of the investment for a single year.

Depreciation Life in Years

This is the number of years over which the firm's pollution control equipment will be depreciated for tax purposes. It is found by taking the lower limit on the asset depreciation range for the appropriate class of assets given in the Internal Revenue Service publication *Revenue Procedure 77-10.* If the lower limit is greater than ten years, the Clean Air Act requires that ten years be used. If the lower limit contains a fractional part of a year, the program should be run with the year lower than the fraction. If the rounding reduces the investment tax credit, the depreciation life should be rounded up and the program run again. The calculation giving the lower penalty should be used. For the Fertilizer Company example, the lower limit on the asset depreciation range for chemicals and allied products is used. This is nine years. Had it been 8.5 years, it would have been rounded down to 8 years.

The Useful Life in Years

The useful life is used to determine the length of each replacement cycle in the penalty calculation. It is also provided by *Revenue Procedure 77-10.* Instead of using the lower limit, the asset guideline period is used. If this contains a fractional part of a year the number should be rounded up to the next integer. The useful life *must* always be greater than or equal to the depreciation life in years.

For the Fertilizer Company example, the "Asset Guideline Period" for chemicals and allied products is used. This is eleven years. Had it been 11.5 years, it would have been rounded up to twelve.

EXHIBIT II-6—FERTILIZER COMPANY BALANCE SHEET, DECEMBER 31, 1978 (000's)

Assets:	
Cash	$18,881
Marketable securities	60,552
Notes and accounts receivable (net)	79,156
Income tax refunds:	
Inventories	116,940
Prepaid expenses	4,290
Total current assets	$279,819
Property, plant and equipment	828,703
Less: Reserve for depreciation	423,554
Net property account	$405,149
Construction funds held by trustee	3,913
Other assets	83,495
Total assets	$772,376
Liabilities:	
Notes payable to bank	$122
Accounts payable and accruals	54,109
Preferred dividends payable	23
Income tax	28,335
Current maturities long term debt	8,929
Total current liabilities	$91,518
Deferred Federal income taxes	57,563
4.5% debentures	21,531
9.75% notes	60,000
Long term lease obligation	43,932
Pollution control facility revenue bonds	46,000
Other long term debt	9,230
4.5% preferred stock ($100 par)	22,044
Common stock ($5 par)	100,000
Capital surplus	58,236
Retained earnings	262,799
Total stockholders' equity	$443,079
Less: Treasury stock	477
Net stockholders' equity	$442,602
Total liabilities and net worth	$772,376

EXHIBIT II-7—CALCULATION OF THE EQUITY, DEBT AND PREFERRED SHARE OF THE INVESTMENT[51] FERTILIZER COMPANY (000's)

The first step in obtaining the equity, debt and preferred share of the investment is to sum the equity and long term debt.[52]

4.5% debentures	$21,531
9.75% notes	60,000
Long term lease	43,932
Pollution control revenue bonds	46,000
Other long term debt	9,230
4.5% preferred stock	22,044
Common stock	100,000
Capital surplus	58,236
Retained earnings	262,799
Total	$623,772
Less: Treasury stock	(477)

[51] For the purposes of this example, preferred, debt, and equity share are calculated for one year only. In actual penalty calculations the preferred, debt, and equity share will be the average of the most recent five years.

[52] Deferred taxes are not included in the calculation of the debt, equity, and preferred share of the investment.

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Total long term capital	$623,295

The second step is to divide the preferred stock by the total long term capital.

Preferred Stock/Total Long Term Capital = 22,044/623,295 = .035 or 3.5%

The third step is to take the sum of the long-term debt accounts. Divide this by the total long-term capital.

4.5% debentures	$21,531
9.75% notes	60,000
Long-term lease	43,932
Pollution control revenue bonds	46,000
Other long-term debt	9,230
Total debt	$180,693

Total Long-Term Debt/Total Long-Term Capital = 180,693/623,295 = .290 or 29.0%

The fourth step is to sum all common equity accounts. Do not include the preferred stock. Divide this number by the total long term capital.

Common stock	$100,000
Capital surplus	58,236
Retained earnings	262,799
Total	$421,035
Less Treasury stock	(477)
Total common equity	$420,588

Total Common Equity/Total Long-Term Capital = 420,558/623,295 = .675 or 67.5%

Thus, 3.5 percent is the preferred stock share of the investment, 29.0 percent is the debt share of the investment and 67.5 percent is the equity share of the investment for a total of 100.0 percent.

Attachment V—Worksheets

This attachment contains worksheets which can be used to calculate input data. Each worksheet will also contain reminders for points which may be overlooked in calculations.

Worksheet A—Calculation of the Capital Expenditure Input

[In dollars]

1. List price or estimate price of the equipment equals	
2. Less: Discount from manufacturer equals	
3. Equals net price of equipment equals	
4. Plus: Sales tax on equipment [1] equals	
5. Plus: Freight and delivery charge equals	
6. Plus: Installation charge equals	
7. Equals estimated cost of equipment installed equals	

Worksheet A—Calculation of the Capital Expenditure Input—Continued

[In dollars]

8. Plus: Value of lost production equals	
9. Plus: Cost of building construction or modifications equals	
10. Equals Total Capital Expenditure equals	

[1] Some corporations subtract sales tax from revenue in the year of purchase. If this is the case, the sales tax is multiplied by (1—Tax Rate) and subtracted from the cost of the equipment rather than added as in Step 4.

Note: Line 7 divided by line 10 is the percentage of qualified investment for calculation of the investment tax credit.

QUALIFIED PERCENTAGE INVESTMENT TAX CREDIT

Line 7/Line 10 = ——— × 10 = ———%

Worksheet B—Operating and Maintenance Expense [1]

[In dollars]

1. Annual labor expense ——— hours × $——— per hour equals	
2. Power cost ——— kwh × $——— per kwh equals	
3. Water cost ——— gallons × $——— per gallon equals	
4. Raw materials and supplies ——— lbs. × $——— per lb. equals	
5. Yearly increase in property tax equals	
6. Cost of production lost due to maintenance or use of equipment equals	
7. Total cost (1+2+3+4+5+6) equals	
8. Less: Value of byproducts ——— lbs. at $——— per lb. equals	
9. Annual operating and maintenance (7–8) equals	
10. Average monthly operating and maintenance (9÷12)	

[1] All costs should be stated in dollars as of the date compliance is expected to be achieved.

Worksheet C—Calculation of Income Tax Rate

1. Marginal Federal tax rate	
2. Marginal State tax rate	
3. Marginal local tax rate	

Calculation of Adjusted Local Tax

(1 State Tax Rate) × Local Tax Rate

(1 ———) × ———

——— × ———

——— adjusted local tax rate

Calculation of Adjusted State and Local Tax

(1 Federal tax rate) × (State tax rate + adjusted local rate)
= (1 − ——) × (—— + ——)
= —— × ——
= —— = adjusted local State tax

Calculation of Tax Rate

100 × (Federal Tax Rate + Adjusted Local and State Tax)
100 × (—— + ——)
= 100 × ——
= —— = Tax Rate

Worksheet D—Weighted Average Interest Rate

1. Total capital expenditure——————
2. Debt percent of the investment ——————
3. Amount of the investment financed with debt (1) ——*(2) ——÷100 = ——
4. Dollar value of issued industrial development bonds ——————
5. Interest rate on corporate (or public utility) bonds ——————
6. Interest rate on industrial development bonds ——————

A. If (4) is larger than or equal to (1), the interest rate entered into the computer is (6).

B. If (4) is larger than (3), the interest rate entered into the computer is (6).

C. If (4) equals zero, the interest rate entered into the computer is (5).

D. If A, B, and C are not true, the interest rate is found using the following formulae:

7. Portion of investment financed with industrial development bonds
(4) —— = (7) ——
(6)
8. Weighted average interest rate
(7) ——*(6) —— +
1 − (7) ——*(5) —— =
—— + —— = (8) ——

The interest rate entered into the computer is (8).

Section IV—Calculation of the Postcompliance Settlement

The post-compliance settlement adjusts the penalty payment to reflect the firm's actual capital and operating expenditures rather than the estimates used in the original penalty calculation. More current estimates of the inflation rate, the discount rate, and the capital structure of the firm are also used. For this purpose, ten types of data are needed:

A schedule of actual capital expenditures made by the firm in reaching compliance.

A schedule of actual operating and maintenance expenditures made by the firm prior to compliance.

A new estimate of post-compliance monthly operating and maintenance expense based on the firm's experience and any additional information which becomes available prior to the post-compliance settlement.

The compound annual inflation rate over the most recent sixty months.

The discount rate averaged over the most recent twenty quarters.

The average equity, preferred stock, and debt share of the capital structure over the most recent five years.

The number of months between the day of compliance and date of post-compliance settlement.

A post-compliance settlement interest rate chosen by the Department of Treasury for overpayments.

A listing of the actual penalty payments made by the firm and the months in which they were made.

The actual portion of the investment financed with industrial development bonds.[53]

In addition to these new data, it will be necessary to have available the remaining financial parameters originally used to calculate the noncompliance penalty for the firm. To continue the example of the hypothetical Fertilizer Company, Exhibit IV-1 contains the data originally used to calculate the noncompliance penalty.

Preparing New Data for Entry Into the Program

In order to calculate the post-compliance settlement, the computer program should be accessed in the manner described on pages III-1 to III-3. After the RUN command has been typed, the terminal will ask if the penalty calculation is for a post-compliance settlement. The computer program will then ask for the data requested in the initial penalty calculation. These data should be entered in the following manner.

1. *Limited Life Facility.* The same response as entered in the initial calculation should be entered. For the Fertilizer Company this value is zero (0).

2. *Industrial Development Bonds.* The actual percentage of the investment financed with industrial development bonds should be entered. For the Fertilizer Company this percentage is zero (0).

3. *Months Out of Compliance.* The actual number of months the firm is out of compliance should be entered. The Fertilizer Company was actually out of compliance nine (9) months.

4. *Months with Precompliance Expenditures.* The actual number of months with precompliance capital or operating and

[53] If this portion differs from the original estimate, the interest rate must be adjusted as discussed below.

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maintenance expenditures should be entered. The Fertilizer Company made precompliance expenditures in three (3) months.

5. *Schedule of Precompliance Expenditures.* The actual precompliance expenditures should be entered. Exhibits IV-2 and IV-3 present the actual precompliance capital and operating and maintenance expenditures, respectively, made by the Fertilizer Company. These expenditures were:

Month	Capital expenditure	Operating and maintenance expenditure
July	$184,050.00	$0.00
August	184,050.00	879.96
September	184,050.00	1,324.40

6. *Initial Monthly O&M Expense.* An estimate of the average monthly operating and maintenance expense which will be incurred over the first year of operating the pollution control equipment should be entered. This can be the estimate used in the initial calculation or, if better information is available, an updated estimate based on this better information. Exhibit IV-4 illustrates the new estimate of monthly operating and maintenance expense for the Fertilizer Company. The new estimate is $1,333.33.

7. *Investment Tax Credit Rate.* This should be the actual investment tax credit as a percent of the initial investment. In the case of the Fertilizer Company this will be line (7) of Exhibit IV-2 divided by line (10) of Exhibit IV-2 multiplied by the statutory rate of 10 percent. This will be 10 percent since the entire investment qualifies for the full investment tax credit.

8. *Income Tax Rate.* The income tax rate used in the initial calculation should be entered. For the Fertilizer Company this rate is 49.73 percent.

9. *Inflation Rate.* The most recent five year average inflation as recorded by the *Chemical Engineering* plant cost index should be entered. In the Fertilizer Company example, this is 7.0 percent.

10. *Discount Rate.* The most recent five year average of the discount rate should be calculated using the data source which was used in the initial calculation. For the Fertilizer Company the discount rate is 15.62 percent.

EXHIBIT IV-1—FERTILIZER COMPANY, JULY 1979, DATA USED FOR ORIGINAL NONCOMPLIANCE PENALTY CALCULATIONS [54]

1. Is this an initial penalty calculation or a postcompliance settlement calculation? 0 - Initial, 1 - Postcompliance: 0

2. Is this a limited life facility? 1 - Yes 0 - No: 0

3. Percentage finance by industrial development bonds = 0.0

4. Months out of compliance = 9

PRECOMPLIANCE EXPENDITURES

Month	Capital expenditure	Operating and maintenance expenditure
February	$166,666.67	$0.00
April	166,666.67	0.00
July	0.00	100.00
August	0.00	1,050.00
September	166,666.67	740.00

5. Initial monthly operating and maintenance expense = 1,250.00

6. Investment tax credit rate = 10.00

7. Income tax rate = 49.73

8. Forecast inflation rate = 7.20

9. Discount rate = 15.91

10. Interest rate = 9.75

11. Preferred stock dividend rate = 9.60

12. Equity share of investment = 67.50

13. Preferred stock share = 3.50

14. Debt share of investment = 29.00

15. Depreciation life = 9

16. Useful life = 11

17. How many months after the first day of noncompliance will the initial penalty payment be made? 0

18. Do you wish to see a lump sum settlement? 1 = Yes, 0 = No: 1.

19. How many months after the first day of noncompliance will the lump sum settlement be made? 0

EXHIBIT IV-2—FERTILIZER COMPANY, CALCULATION OF ACTUAL CAPITAL EXPENDITURE, JUNE 1, 1980

1. List price or estimated price of the equipment equals	$536,588.92
2. Less: Discount from manufacturer equals	(10,731.78)
3. Equals net price of equipment equals	525,857.14
4. Plus: Sales tax on equipment [1] equals	26,292.86
5. Plus: Freight and delivery charge equals	0
6. Plus: Installation charge equals	0
7. Equals estimated cost of equipment installed equals	$552,150.00
8. Plus: Value of lost production equals	0
9. Plus: Cost of building construction or modifications equals	0
10. Equals total capital expenditure equals	$552,150.00

[1] Sales tax in this case was not subtracted from revenue in the year of purchase.

The capital expenditures were made in three equal monthly payments of $184,050.00 starting in the seventh month of noncompliance.

EXHIBIT IV-3—ACTUAL MONTHLY PRECOMPLIANCE OPERATING AND MAINTENANCE EXPENSE, FERTILIZER COMPANY, JUNE 1, 1980

Precompliance operating expense:		
Months 1-9		$0
Month 10		
Labor (84 hrs at $10)	$840.00	
Power (1200 kwh at .0333 kwh)	39.96	
Total		$879.96
Month 11		
Labor (110 hrs at $10)	$1,100.00	
Power (6739 kwh at .0333 kwh)	224.40	
Total		$1,324.40

EXHIBIT IV-4—FERTILIZER COMPANY, OPERATING AND MAINTENANCE EXPENSE, JUNE 1, 1980

1. Annual labor expense 1,072 hours × $10.81 per hour equals	$11,588.32
2. Power cost 89,991.5 kwh × $0.038 per kwh equals	3,419.68
3. Water cost ——— gallons × $——— per gallon equals	0
4. Raw materials and supplies 1,200 lbs. × $1.20 per lb. equals	1,440.00
5. Yearly increase in property tax equals	0
6. Cost of production lost due to maintenance or use of equipment equals	0
7. Total cost (1 + 2 + 3 + 4 + 5 + 6) equals	16,448.00
8. Less: Value of byproducts 800 lbs. at $.56 per lb. equals	(448.00)
9. Annual operating and maintenance (7-8) equals	$16,000.00
10. Average monthly operating and maintenance (9 ÷ 12) equals	1,333.33

11. *Interest Rate.* The interest rate used in the initial calculation should be entered unless the amount of industrial development bonds sold differs from the estimated amount used in the initial penalty calculation. If the amount of industrial development bonds sold differs from the estimated amount, the interest rate must be altered to reflect this.

To re-estimate the interest rate, the total capital expenditure and the dollar value of issued industrial development bonds should be updated on Worksheet D, and the interest rate should be recalculated. (See Worksheet D, lines 1 and 3.) The interest rates on corporate bonds and industrial development bonds entered on the worksheet should not be updated.

For the Fertilizer Company, the interest rate used in the initial calculation, 9.75 percent, is entered.

12. *Preferred Stock Dividend Rate.* The rate used in the initial calculation should be entered. For the Fertilizer Company, the preferred stock dividend rate is 9.60 percent.

13. *Equity Share, Debt Share, and Preferred Stock Share of the Investment.* The equity, debt, and preferred stock share should be calculated as illustrated in Section II using the most recent five years of annual statements. The Fertilizer Company's five year average equity share, preferred stock share, and debt share are 67.5 percent, 3.5 percent, and 29.0 percent, respectively.

14. *Depreciation Life.* The depreciation life used in the initial calculation should be entered. This is nine (9) years for the Fertilizer Company.

15. *Useful Life.* The useful life used in the initial calculation should be entered. This is eleven (11) years for the Fertilizer Company.

After these data are provided, the computer program will ask for data on the actual penalty payments made by the firm and the month in which each payment was made. The data are entered in the following manner.

1. *Number of Penalty Payments Made by the Firm.* This is the actual number of payments made by the firm. If more than one payment is made in a month, they should be totaled and counted as one payment.

2. *Month of Penalty Payment.* This is the number of the month in which the penalty payment is received by EPA, beginning with the month the firm is out of compliance. For example, a firm making a payment at the time notice of noncompliance is issued would enter a one. If a six-month delay in payment occurred, a seven would be entered.

3. *Actual Penalty Payment.* This is the dollar amount of the penalty actually paid by the firm in each month. The payment entered should not include any of the penalty for late payment. The data entered in the Fertilizer Company example are identical to the penalties calculated in the last section and shown in Exhibit III-5. They are:

Month	Penalty payment
January	$5,544.35
April	5,641.56
July	5,740.47

The program now asks for the Treasury interest rate to be used in the calculation of the interest on overpayments[55] and the

[55] The Treasury has determined that the interest rate used to calculate the interest owed on underpayments will be the discount rate which has already been entered into the computer.

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number of months from compliance until settlement. These data are entered in the following manner.

1. *Treasury Interest Rate.* This is an annual interest rate set by the Secretary of the Treasury for the calculation of interest on overpayments. It is entered as a percent. For the Fertilizer Company, the rate chosen was 9.25 percent.

2. *Months From Compliance to Settlement.* The firm should enter the number of months from the date it comes into compliance to the date of the post-compliance settlement. In the example, the post-compliance settlement was made 2 months after the Fertilizer Company came into compliance.

Exhibit IV-5 illustrates all the input for the post-compliance settlement for the Fertilizer Company.

Output From the Post-Compliance Settlement Calculation

The output from the post-compliance settlement calculation incorporates the data on penalty payments made by the firm and compares these payments to a penalty schedule based on actual expenditures made to achieve compliance. The output consists of two parts:

Printing of the penalty paid in each month and the penalty determined from actual expenditures. The difference between the actual penalty and the payment made by the firm is calculated in each month.

The settlement due EPA or due to the firm is calculated.

The output from the post-compliance settlement for the Fertilizer Company is shown in Exhibit IV-6. The first column prints the month in which a penalty payment was made or a penalty payment was required based on the post-compliance penalty calculation. The second column contains the actual payment made by the firm. The third column is the penalty based on actual expenditures made by the firm coming into compliance.

The program next calculates the difference between the penalty payment in each month and the new penalty calculation based on actual expenditures. The difference between the payment made and the actual penalty is then charged interest at the rate specified by the Treasury for overpayments if the penalty paid exceeds the actual penalty or at the discount rate if the penalty paid is less than the actual penalty.[56]

[56]The method for calculating the interest on the amount of overpayment or underpayment is described in detail in Section V of the Technical Support Document.

EXHIBIT IV-5
INPUT FOR CALCULATION OF POST-COMPLIANCE SETTLEMENT

```
      1. IS THIS AN INITIAL PENALTY CALCULATION
         OR A POST-COMPLIANCE SETTLEMENT CALCULATION?
         0=INITIAL, 1=POST-COMPLIANCE:
?
1
   ITEMS 4 AND 5 SHOULD SHOW AMOUNTS ACTUALLY
   EXPENDED
      2. IS THIS A LIMITED LIFE FACILITY? 1=YES 0=NO
?
0
      3. PERCENTAGE FINANCED BY INDUSTRIAL DEVELOPMENT BONDS=
?
0
      4. MONTHS OUT OF COMPLIANCE=
?
9
   HOW MANY MONTHS HAVE PRECOMPLIANCE CAPITAL OR
   PRECOMPLIANCE O&M EXPENDITURES?
?
3
   FOR EACH MONTH OF PRECOMPLIANCE CAPITAL OR O&M
   ENTER THE NUMBER OF THE MONTH,THE CAPITAL EXPENDITURE
   AND THE O&M EXPENSE SEPARATED BY COMMAS.

   MONTH,CAPITAL,O&M
?
7,184050.00,0
?
8,184050.00,879.96
?
9,184050.00,1324.40
      5. INITIAL MONTHLY O & M EXPENSE=
?
1333.33
      6. INVESTMENT TAX CREDIT RATE=
?
10.0
      7. INCOME TAX RATE=
?
49.73
      8. FORECAST INFLATION RATE=
?
7.0
      9. DISCOUNT RATE=
?
15.62
      10. INTEREST RATE=
?
9.75
```


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EXHIBIT IV-5
INPUT FOR CALCULATION OF POST-COMPLIANCE SETTLEMENT
(continued)

```
    11. PREFERRED STOCK DIVIDEND RATE=
?
9.60
    12. EQUITY SHARE OF INVESTMENT=
?
67.5
    13. PREFERRED STOCK SHARE=
?
3.5
    14. DEBT SHARE OF INVESTMENT=
?
29.0
    15. DEPRECIATION LIFE=
?
9
    16. USEFUL LIFE=
?
11
    20. HOW MANY PENALTY PAYMENTS WERE MADE?
?
3
        20. PAYMENT NUMBER  1: ENTER MONTH,AMOUNT
?
1,5544.35
        20. PAYMENT NUMBER  2: ENTER MONTH,AMOUNT
?
4,5641.56
        20. PAYMENT NUMBER  3: ENTER MONTH,AMOUNT
?
7,5740.47
    21. TREASURY INTEREST RATE=
?
9.25

    22. MONTHS FROM COMPLIANCE UNTIL SETTLEMENT=
?
2
```

EXHIBIT IV-6—THE POST-COMPLIANCE SETTLEMENT

[Straight line, rapid amortization]

Month	Paid	Penalty	Due EPA	Due firm
January	$544.35	$8,616.09	$3,071.74	0.0
April	5,641.56	8,763.06	3,121.50	0.0
July	5,740.47	8,912.55	3,172.08	0.0

Settlement due EPA 10,317.30

The post-compliance settlement was calculated and paid two months after the Fertilizer Company came into compliance. The total post-compliance settlement paid by the firm to EPA is $10,317.30.

SECTION V—SPECIAL CONDITIONS

The preceding four sections enable the user to calculate the noncompliance penalty and post-compliance settlement when the source is privately-owned and when compliance is achieved by modification of existing plant and equipment. In addition, it is assumed that financing would not involve industrial development bonds. Section V will expand the number of cases in which the penalty program is applicable and enable the user to compute the noncompliance penalty in the following situations.

Plant and equipment necessary for compliance are financed through the sale of tax-exempt industrial development bonds.

The source is operated by a local, state or federal government.

The source has a limited useful life.

The noncompliance penalty in all three cases is calculated using the program PENALTY. However, it is necessary to modify some of the data entered into the program to reflect the unique characteristics of each of these situations. The following section describes special data requirements and modifications in data entry. It should be stressed that all data and data entry procedures discussed in the four previous sections are applicable to these special conditions except where specific changes are required.

INDUSTRIAL DEVELOPMENT BONDS

Industrial development bonds for pollution control equipment are used by firms in order to secure debt financing at an interest cost lower than the current rate on industrial bonds.

This lower interest rate is possible because the development bonds are issued by a local or state government for the corporation and the interest payments received by the bondholder are exempt from federal income tax. The corporation pays the principal and interest payments, but because of the tax-exempt status of the interest, the interest charges are often a few percentage points below corporate debt of similar quality.

The Revenue Act of 1978 requires that firms financing with industrial development bonds receive only one-half of the investment tax credit when rapid amortization is used. For firms financing in part with development bonds, a pro-rata portion of this financing should be applied to the facility for determining the investment tax credit. The computer program will automatically prorate the investment tax credit. The user must provide two types of data.

The percentage of the investment financed by industrial development bonds.

The weighted average interest rate for the investment.[57]

Data are gathered for the calculation of the penalty in the same manner as described in Section II. In addition, the user must perform the following calculations.

1. *Percent financed with industrial development bonds.* This percentage is obtained by dividing the total issue of tax-exempt pollution control industrial development bonds by the capital investment. In the Fertilizer Company example, the estimated capital investment was $500,000. If the firm sold $200,000 in industrial development bonds, the percentage entered would be forty. This would be entered as *40.0*. If the percentage exceeds one hundred, *100.0* should be entered.[58]

2. *Interest rate on industrial development bonds.* The interest rate used for pollution control industrial development bonds is published by Smith, Barney, Harris, Upham & Co., in the *Bond Markets Review*. The review is published weekly and the current yield on bonds is printed on the last page. The most recent yield published will be the interest rate used for industrial development bonds.

There are thus only two changes in the data entered for industrial development bonds. A percentage of the project financed with tax-exempt bonds is entered, and the interest rate used is the weighted average calculated using Worksheet D of Section II. All other data entry remains the same.

---

[57] A worksheet is included in Section II (Worksheet D) to aid in calculating the weighted average interest rate.

[58] The firm may issue bonds in a volume much higher than the capital investment. In this case financing is entered as 100 percent. The program will not accept data higher than 100 percent.

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GOVERNMENT-OWNED FACILITIES

The use of the noncompliance penalty program for government facilities requires that all cash flows related to taxes be eliminated. In addition, the discount rate for all cash flows is entered at ten percent. Exhibit V-1 shows the data entry procedure for noncomplying sources owned by governments. Data labeled "no change" are calculated using the methods described in Section II.

FACILITIES WITH LIMITED USEFUL LIVES

The noncompliance penalty computer program will calculate penalties for facilities with limited useful lives. In cases where a noncomplying facility is to be operated for a period of time and then retired, the current program may be used. Capital and operating and maintenance cost estimates are made based on what it *would cost* to bring the source into compliance and the calculation proceeds in the normal manner. In such cases there are no precompliance operating and maintenance expenditures and the total capital expenditure is entered in the last month There is no post-compliance settlement.

In cases where the noncomplying source is to be replaced by a new, complyig facility after some period of noncompliance, program inputs and operation will be slightly different than at present. In such cases the program will:

Ask if the calculation is for a limited life facility that is being replaced,

Request an estimate of the capital and annual operating expenses required to bring the old source into compliance,

EXHIBIT V-1—DATA ENTRY FOR GOVERNMENT FACILITIES

Data category	Program entry
Precompliance capital expenditures	(*)
Precompliance operating and maintenance	(*)
Initial monthly operating and maintenance	(*)
Investment tax credit	0
Income tax rate	0
Inflation rate	(*)
Discount rate	10.0
Interest rate	0
Preferred dividend rate	0
Equity share of the investment	100.0
Preferred share of investment	0
Debt share of investment	0
Depreciation life in years	(*)
Useful life in years	(*)

*No change

Request a schedule of precompliance total capital expenditures (for productive capability plus pollution control equipment) required to build the new source,

Request a schedule of precompliance O&M expenditures (for productive capability and pollution control equipment) associated with the new source, and

Request an estimate of monthly production costs including pollution control operating and maintenance expenses at the new source.

The program will then calculate the penalty based on the costs of compliance at the old source but will be adjusted for precompliance expenditures at the new source. Once the new source is in operation and the old source is retired (and, thus, full compliance is achieved), a post-compliance settlement can be made. Such a settlement will consider changes in the compliance expenditures associated with the new source relative to the estimates made when the initial penalty calculation was carried out and updates of the monthly production costs, the inflation rate, the discount rate, and the capital structure of the firm.

APPENDIX C—COMPUTER PROGRAM

NOTE: EPA will make copies of Appendix C available from: Director, Division of Stationary Source Enforcement, EN-341, 401 M Street N.W., Washington, D.C. 20460.

PART 79—REGISTRATION OF FUELS AND FUEL ADDITIVES

Subpart A—General Provisions

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79.20 Notification by additive manufacturer.
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Sec.

Subpart D—Designation of Fuels and Additives

79.30 Scope.
79.31 Additives.
79.32 Motor vehicle gasoline.
79.33 Motor vehicle diesel fuel.

AUTHORITY: Secs. 211 and 301(a) of the Clean Air Act, 42 U.S.C. 1857f-6c and 1857g.

SOURCE: 40 FR 52011, Nov. 7, 1975, unless otherwise noted.

Subpart A—General Provisions

§ 79.1 Applicability.

The regulations of this part apply to the registration of fuels and fuel additives designated by the Administrator, pursuant to section 211 of the Clean Air Act (42 U.S.C. 1857f-6c, as amended by section 9, Pub. L. 91-604).

§ 79.2 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Act" means the Clean Air Act (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604).

(b) "Administrator" means the Administrator of the Environmental Protection Agency.

(c) "Fuel" means any material which is capable of releasing energy or power by combustion or other chemical or physical reaction.

(d) "Fuel manufacturer" means any person who, for sale or introduction into commerce, produces or manufactures a fuel or causes or directs the alteration of the chemical composition of, or the mixture of chemical compounds in, a bulk fuel by adding to it an additive.

(e) "Additive" means any substance, other than one composed solely of carbon and/or hydrogen, that is intentionally added to a fuel named in the designation (including any added to a motor vehicle's fuel system) and that is not intentionally removed prior to sale or use.

(f) "Additive manufacturer" means any person who produces or manufactures an additive for use as an additive and/or sells an additive under his own name.

(g) "Range of concentration" means the highest concentration, the lowest concentration, and the average concentration of an additive in a fuel.

(h) "Chemical composition" means the name and percentage by weight of each compound in an additive and the name and percentage by weight of each element in an additive.

(i) "Chemical structure" means the molecular structure of a compound in an additive.

(j) "Impurity" means any chemical element present in an additive that is not included in the chemical formula or identified in the breakdown by element in the chemical composition of such additive.

§ 79.3 Availability of information.

The availability to the public of information provided to, or otherwise obtained by, the Administrator under this part shall be governed by Part 2 of this chapter.

[41 FR 36918, Sept. 1, 1976]

§ 79.4 Requirement of registration.

(a) Fuels. (1) No manufacturer of any fuel designated under this part shall, after the date prescribed for such fuel in this part, sell, offer for sale, or introduce into commerce such fuel unless the Administrator has registered such fuel.

(2) No manufacturer of a registered fuel shall add or direct the addition to it of an additive which he has not previously reported unless he has notified the Administrator of such intended use, including the expected or estimated range of concentration. If necessary to meet an unforeseen production problem, however, a fuel manufacturer may use an additive that he has not previously reported provided that (i) the additive is on the current list of registered additives and (ii) the fuel manufacturer notifies the Administrator within 30 days regarding such unforeseen use and his plans regarding continued use, including the expected or estimated range of concentration.

(3) Any designated fuel that is (i) in a research, development, or test status; (ii) sold to automobile, engine, or component manufacturers for research, development, or test purposes; or (iii) sold to automobile manufacturers for factory fill, and is not in any

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case offered for commercial sale to the public, shall be exempt from registration.

(4) A domestic fuel manufacturer may purchase and offer for commercial sale foreign-produced fuel containing unidentified additives provided that within 30 days of his offer for sale he notifies the Administrator of the purchase, the source of purchase, the quantity purchased, and summarized results of any tests performed to determine the acceptability of the purchased fuel to the fuel manufacturer.

(b) Additives. (1) No manufacturer of any additive designated under this part shall, after the date prescribed for such additive in this part, sell, offer for sale, or introduce into commerce such additive for use as an additive unless the Administrator has registered such additive.

(2) Any designated additive that is either (i) in a research, development, or test status or (ii) sold to petroleum, automobile, engine, or component manufacturers for research, development, or test purposes, and in either case is not offered for commercial sale to the public, shall be exempt from registration.

(3) Process chemicals used by refineries during the refinery process are exempted from the requirement for registration.

(4) If an additive manufacturer prepares for sale only to fuel manufacturers (i) a blend or mixture of two or more registered additives or (ii) a blend or mixture of one or more registered additives with one or more substances containing only carbon and/or hydrogen, he will not be required to register such blend or mixture provided he will, upon request, furnish the Administrator with the names and percentages by weight of all components of such blend or mixture.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.5 Periodic reporting requirements.

(a) Fuel manufacturers. (1) For each calendar quarter (January through March, April through June, July through September, October through December) commencing after the date prescribed for a particular fuel in Subpart D, fuel manufacturers shall submit to the Administrator a report for each registered fuel showing (i) the range of concentration of each additive reported under § 79.11(a) and (ii) the volume of such fuel produced in the quarter. Reports shall be submitted within 45 days after the close of the reporting period on forms supplied by the Administrator upon request.

(2) Fuel manufacturers shall submit to the Administrator a report annually for each registered fuel providing additional data and information as specified in § 79.31(c) and (d) in the designation of the fuel in Subpart D. Reports shall be submitted on or before March 31 for the preceding year or part thereof on forms supplied by the Administrator upon request. If the date prescribed for a particular fuel in Subpart D or the later registration of a fuel is between October 1 and December 31, no report will be required for the period to the end of that year.

(b) Additive manufacturers. Additive manufacturers shall submit to the Administrator a report annually for each registered additive providing additional data and information as specified in subparagraphs (c) and (d) in the designation of the additive in Subpart D. Additive manufacturers shall also report annually the volume of each additive produced. Reports shall be submitted on or before March 31 for the preceding year or part thereof on forms supplied by the Administrator upon request. If the date prescribed for a particular additive in Subpart D or the later registration of an additive is between October 1 and December 31, no report will be required for the period to the end of that year. These periodic reports shall not, however, be required for any additive that is (1) an additive registered under another name, (2) a blend or mixture of two or more registered additives, or (3) a blend or mixture of one or more registered additives with one or more substances containing only carbon and/or hydrogen.

§ 79.6 Requirement for testing.

(a) The Administrator may establish procedures and protocols for the conduct of tests to determine potential

public health effects of a designated fuel or additive (including, but not limited to, carcinogenic, teratogenic, or mutagenic effects) and may thereafter require a fuel manufacturer or an additive manufacturer to conduct tests in conformance with such test procedures and protocols.

(b) In order to obtain such information as is reasonable and necessary to determine the emissions resulting from the use of a fuel or an additive in a fuel, the effect of such fuel or additive on the emission control performance of any motor vehicle or motor vehicle engine, or the extent to which such emissions affect the public welfare, the Administrator may require a fuel manufacturer or an additive manufacturer to conduct tests in accordance with protocols based on generally accepted test methods and procedures.

(c) Any test required under this section shall be performed in accordance with a time schedule prescribed by the Administrator, after consultation with the manufacturer involved.

(d) The Administrator may require a fuel manufacturer to perform tests under this section on any fuel registered for such manufacturer or an additive manufacturer to perform tests under this section on any additive registered for such manufacturer. He may not require any test as a prerequisite of registration unless it is part of a test protocol established by regulation a reasonable time prior to notification by the manufacturer.

§ 79.7 Samples for test purposes.

When the Administrator requires for test purposes a fuel or additive which is not readily available in the open market, he may request the manufacturer of such fuel or additive to furnish a sample in a reasonable quantity. The fuel or additive manufacturer shall comply with such request within 30 days.

§ 79.8 Penalties.

Any person who violates section 211(a) of the Act or who fails to furnish any information required under this part shall forfeit and pay to the United States a civil penalty of $10,000 for each and every day of the continuance of such violation, which shall accrue to the United States and be recovered in a civil suit in the name of the United States, brought in the district in which such person does business. The Administrator may, upon application therefor, remit or mitigate any such forfeiture; and he shall have authority to determine the facts upon all such applications.

Subpart B—Fuel Registration Procedures

§ 79.10 Notification of fuel manufacturer.

Any manufacturer of a designated fuel who wishes to have such fuel registered shall notify the Administrator in accordance with § 79.11 at least 60 days prior to the date prescribed for such fuel in Subpart D or, after such prescribed date, at least 30 days prior to the date on which such fuel manufacturer proposes to begin to sell, offer for sale, or introduce into commerce such fuel. If a fuel manufacturer produces more than one grade or brand of a designated fuel, only one notification or report is required for that designated fuel, showing highest, lowest, and average values for all such grades or brands. Each notification shall be signed by the fuel manufacturer or his agent and shall be submitted on such forms as the Administrator will supply on request.

§ 79.11 Information and assurances to be provided by the fuel manufacturer.

Each notification submitted by a fuel manufacturer shall include the following:

(a) The commercial identifying name of each additive that will or may be used in a designated fuel subsequent to the date prescribed for such fuel in Subpart D;

(b) The name of the additive manufacturer of each additive named;

(c) The range of concentration of each additive named, as follows:

(1) In the case of an additive which has been or is being used in the designated fuel, the range during any 3-month or longer period prior to the date of submission;

(2) In the case of an additive which has not been used in the designated fuel, the expected or estimated range;

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(d) The purpose-in-use of each additive named;

(e) The description (or identification, in the case of a generally accepted method) of a suitable analytical technique (if one is known) that can be used to detect the presence of each named additive in the designated fuel and/or to measure its concentration therein;

(f) Such other data and information as are specified in the designation of the fuel in Subpart D;

(g) Assurances that the fuel manufacturer will notify the Administrator in writing and within a reasonable time of any change in:

(1) The name of any additive previously reported;

(2) The name of the manufacturer of any additive being used;

(3) The purpose-in-use of any additive;

(4) Information submitted pursuant to paragraph (e) of this section;

(h) Assurances that the fuel manufacturer will not represent, directly or indirectly, in any notice, circular, letter, or other written communication, or any written, oral, or pictorial notice or other announcement in any publication or by radio or television, that registration of the fuel constitutes endorsement, certification, or approval by any agency of the United States.

§ 79.12 Determination of noncompliance.

Whenever the Administrator determines that a notification fails to comply with the regulations of this part, he shall within 30 days of receipt of the notification (in the case of registration prior to the date prescribed for the fuel in Subpart D, by such prescribed date) inform the noncomplying fuel manufacturer of the reasons for such determination.

[41 FR 21324, May 25, 1976]

§ 79.13 Registration.

(a) If the provisions of this part requiring the submission of information and the giving of assurances have been complied with for a particular fuel, the Administrator shall, within 30 days of receipt of the notification (in the case of registration prior to the date prescribed for the fuel in Subpart D, by such prescribed date), register that fuel and notify the fuel manufacturer of such registration.

(b) The Administrator shall maintain a list of registered fuels, which shall be available to the public upon request.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.14 Termination of registration of fuels.

Registration may be terminated by the Administrator if the fuel manufacturer requests such termination in writing.

Subpart C—Additive Registration Procedures

§ 79.20 Notification by additive manufacturer.

Except as provided in § 79.23(b), any manufacturer of a designated additive who wishes to have such additive registered shall notify the Administrator in accordance with § 79.21 at least 150 days prior to the date prescribed for such additive in Subpart D or, after such prescribed date, at least 30 days prior to the date on which such additive manufacturer proposes to begin to sell, offer for sale, or introduce into commerce such additive. Each notification shall be signed by the additive manufacturer or his agent and shall be submitted on such forms as the Administrator will supply upon request.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.21 Information and assurances to be provided by the additive manufacturer.

Each notification submitted by an additive manufacturer shall include the following:

(a) The chemical composition of the additive with the methods of analysis identified, except that

(1) If the chemical composition is not known, full disclosure of the chemical process of manufacture will be accepted in lieu thereof;

(2) In the case of an additive for engine oil, only the name, percentage by weight, and method of analysis of each element in the additive are re-

quired provided, however, that a percentage figure combining the percentages of carbon, hydrogen, and/or oxygen may be provided unless the breakdown into percentages for these individual elements is already known to the registrant.

(3) In the case of a purchased component, only the name, manufacturer, and percent by weight of such purchased component are required if the manufacturer of the component will, upon request, furnish the Administrator with the chemical composition thereof.

(b) The chemical structure of each compound in the additive if such structure is known and is not adequately specified by the name given under "chemical composition." Nominal identification is adequate if mixed isomers are present.

(c) The description (or identification, in the case of a generally accepted method) of a suitable analytical technique (if one is known) that can be used to detect the presence of the additive in any fuel named in the designation and/or to measure its concentration therein.

(d) Fuels in which the use of the additive is recommended and the manufacturer's recommended range of concentration and purpose-in-use in each.

(e) Such other data and information as are specified in the designation of the additive in Subpart D.

(f) Assurances that any change in information submitted pursuant to (1) paragraphs (a), (b), (c), and (d) of this section will be provided to the Administrator in writing within 30 days of such change; and (2) paragraph (e) of this section as provided in § 79.5(b).

(g) Assurances that the additive manufacturer will not represent, directly or indirectly, in any notice, circular, letter, or other written communication or any written, oral, or pictorial notice or other announcement in any publication or by radio or television, that registration of the additive constitutes endorsement, certification, or approval by any agency of the United States.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.22 Determination of noncompliance.

Whenever the Administrator determines that a notification fails to comply with the regulations of this part, he shall within 30 days of the receipt of the notification (in the case of registration prior to the date prescribed for the additive in Subpart D, by such prescribed date) inform the noncomplying additive manufacturer of the reasons for such determination.

[41 FR 21324, May 25, 1976]

§ 79.23 Registration.

(a) If the provisions of this part requiring the submission of information and the giving of assurances have been complied with for a particular additive, the Administrator shall, within 30 days of receipt of the notification (in the case of registration prior to the date prescribed for the additive in Subpart D, by such prescribed date), register that additive and notify the additive manufacturer of such registration.

(b) Any additive which had been registered under the provisions of this part prior to the promulgation date of these regulations shall be deemed registered under these regulations upon such promulgation date. The information requirements of § 79.21 must be complied with for any such additive within 6 months after the promulgation of this part.

(c) The Administrator shall maintain a list of registered additives, which shall be available to the public upon request.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.24 Termination of registration of additives.

Registration may be terminated by the Administrator if the additive manufacturer requests such termination in writing.

Subpart D—Designation of Fuels and Additives

§ 79.30 Scope.

Fuels and additives designated and dates prescribed by the Administrator for the registration of such fuels and

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additives, pursuant to section 211 of the Act, are listed in this subpart. In addition, specific informational requirements under §§ 79.11(f) and 79.21(e) are set forth for each designated fuel or additive. Additional fuels and/or additives may be designated and pertinent dates and additional specific informational requirements prescribed as the Administrator deems advisable.

§ 79.31 Additives.

(a) All additives produced or sold for use in motor vehicle gasoline and/or motor vehicle diesel fuel are hereby designated. The Act defines the term "motor vehicle" to mean any self-propelled vehicle designed for transporting persons or property on a street or highway. For purposes of this registration, however, additives specifically manufactured and marketed for use in motorcycle fuels are excluded.

(b) All designated additives must be registered by July 7, 1976, except as provided in § 79.23(b).

(c) In accordance with §§ 79.5(b) and 79.21(e), and to the extent such information is known to the additive manufacturer as a result of testing conducted for reasons other than additive registration or reporting purposes, the additive manufacturer shall furnish the highest, lowest, and average values of the impurities in each designated additive, if greater than 0.1 percent by weight. The methods of analysis in making the determinations shall also be given.

(d) In accordance with §§ 79.5(b) and 79.21(e), and to the extent such information is known to the additive manufacturer, he shall furnish summaries of any information developed by or specifically for him concerning the following items:

(1) Mechanisms of action of the additive;

(2) Reactions between the additive and the fuels listed in paragraph (a) of this section;

(3) Identification and measurement of the emission products of the additive when used in the fuels listed in paragraph (a) of this section;

(4) Effects of the additive on all emissions;

(5) Toxicity and any other public health or welfare effects of the emission products of the additive;

(6) Effects of the emission products of the additive on the performance of emission control devices/systems. Such submissions shall be accompanied by a description of the test procedures used in obtaining the information. Information will be considered to be known to the additive manufacturer if a report thereon has been prepared and circulated or distributed outside the research department or division.

(Secs. 211, 301(a), Clean Air Act as amended (40 U.S.C. 7545, 7601(a)))

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976; 43 FR 28490, June 30, 1978]

§ 79.32 Motor vehicle gasoline.

(a) The following fuels commonly or commercially known or sold as motor vehicle gasoline are hereby individually designated:

(1) Motor vehicle gasoline, unleaded—motor vehicle gasoline that contains no more than 0.05 gram of lead per gallon;

(2) Motor vehicle gasoline, leaded, premium—motor vehicle gasoline that contains more than 0.05 gram of lead per gallon and is sold as "premium;"

(3) Motor vehicle gasoline, leaded, non-premium—motor vehicle gasoline that contains more than 0.05 gram of lead per gallon but is not sold as "premium."

The Act defines the term "motor vehicle" to mean any self-propelled vehicle designed for transporting persons or property on a street or highway. For purposes of this registration, however, gasoline specifically blended and marketed for motorcycles is excluded.

(b) All designated motor vehicle gasolines must be registered by September 7, 1976.

(c) In accordance with §§ 79.5(a)(2) and 79.11(f), and to the extent such information is known to the fuel manufacturer as a result of testing conducted for reasons other than fuel registration or reporting purposes, the fuel manufacturer shall furnish the data listed below. The highest, lowest, and average values of the listed character-

istics/properties are to be reported. For initial registration, data shall be given for any 3-month or longer period prior to the date of submission. For annual reports thereafter, data shall be for the calendar year, except that if the first required annual report covers a period of less than a year, the data may be for such shorter period.

(1) Hydrocarbon composition (aromatic content, olefin content, saturate content), with the methods of analysis identified;

(2) Polynuclear organic material content, sulfur content, and trace element content, with the methods of analysis identified;

(3) Reid vapor pressure;

(4) Distillation temperatures (10 percent point, end point);

(5) Research octane number and motor octane number.

(d) In accordance with §§ 79.5(a)(2) and 79.11(f), and to the extent such information is known to the fuel manufacturer, he shall furnish summaries of any information developed by or specifically for him concerning the following items:

(1) Mechanisms of action of each additive he reports;

(2) Reactions between such additives and motor vehicle gasoline;

(3) Identification and measurement of the emission products of such additives when used in motor vehicle gasoline;

(4) Effects of such additives on all emissions;

(5) Toxicity and any other public health or welfare effects of the emission products of such additives;

(6) Effects of the emission products of such additives on the performance of emission control devices/systems. Such submissions shall be accompanied by a description of the test procedures used in obtaining the information. Information will be considered to be known to the fuel manufacturer if a report thereon has been prepared and circulated or distributed outside the research department or division.

[40 FR 52011, Nov. 7, 1975, as amended at 41 FR 21324, May 25, 1976]

§ 79.33 Motor vehicle diesel fuel.

(a) The following fuels commonly or commercially known or sold as motor vehicle diesel fuel are hereby individually designated:

(1) Motor vehicle diesel fuel, grade 1-D;

(2) Motor vehicle diesel fuel, grade 2-D.

The Act defines the term "motor vehicle" to mean any self-propelled vehicle designed for transporting persons or property on a street or highway.

(b) All designated motor vehicle diesel fuels must be registered within 12 months after promulgation of this part.

(c) In accordance with §§ 79.5(a)(2) and 79.11(f), and to the extent such information is known to the fuel manufacturer as a result of testing conducted for reasons other than fuel registration or reporting purposes, the fuel manufacturer shall furnish the data listed below. The highest, lowest, and average values of the listed characteristics/properties are to be reported. For initial registration, data shall be given for any 3-month or longer period prior to the date of submission. For annual reports thereafter, data shall be for the calendar year, except that if the first required annual report covers a period of less than a year, the data may be for such shorter period.

(1) Hydrocarbon composition (aromatic content, olefin content, saturate content), with the methods of analysis identified;

(2) Polynuclear organic material content, sulfur content, and trace element content, with the methods of analysis identified;

(3) Distillation temperatures (90 percent point, end point);

(4) Cetane number or cetane index;

(d) In accordance with §§ 79.5(a)(2) and 79.11(f), and to the extent such information is known to the fuel manufacturer, he shall furnish summaries of any information developed by or specifically for him concerning the following items:

(1) Mechanisms of action of each additive he reports;

(2) Reactions between such additives and motor vehicle diesel fuel;

(3) Identification and measurement of the emission products of such additives when used in motor vehicle diesel fuel;

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(4) Effects of such additives on all emissions;

(5) Toxicity and any other public health or welfare effects of the emission products of such additives.

Such submission shall be accompanied by a description of the test procedures used in obtaining the information. Information will be considered to be known to the fuel manufacturer if a report thereon has been prepared and circulated or distributed outside the research department or division.

PART 80—REGULATION OF FUELS AND FUEL ADDITIVES

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AUTHORITY: Secs. 211 and 301(a) of the Clean Air Act as amended, 42 U.S.C. 7545 and 7601, unless otherwise noted.

SOURCE: 38 FR 1255, Jan. 10, 1973, unless otherwise noted.

Subpart A—General Provisions

§ 80.1 Scope.

(a) This part prescribes regulations for the control and/or prohibition of fuels and additives for use in motor vehicles and motor vehicle engines. These regulations are based upon a determination by the Administrator that the emission product of a fuel or additive will endanger the public health, or will impair to a significant degree the performance of a motor vehicle emission control device in general use or which the Administrator finds has been developed to a point where in a reasonable time it would be in general use were such regulations promulgated; and certain other findings specified by the Act.

(b) Nothing in this part is intended to preempt the ability of State or local governments to control or prohibit any fuel or additive for use in motor vehicles and motor vehicle engines which is not explicitly regulated by this part.

[38 FR 1255, Jan. 10, 1973, as amended at 38 FR 33741, Dec. 6, 1973; 42 FR 25732, May 19, 1977]

§ 80.2 Definitions.

As used in this part:

(a) "Act" means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(b) "Administrator" means the Administrator of the Environmental Protection Agency.

(c) "Gasoline" means any fuel sold in any State[1] for use in motor vehicles and motor vehicle engines, and commonly or commercially known or sold as gasoline.

(d) "Research octane number" means a measurement of a gasoline's knock characteristics which is determined by American Society for Testing and Materials analytical method designated D-2699.

(e) "Lead additive" means any substance containing lead or lead compounds.

(f) "Leaded gasoline" means gasoline which is produced with the use of any lead additive or which contains more than 0.05 gram of lead per gallon or more than 0.005 gram of phosphorus per gallon.

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[1] "State" means a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, and American Samoa.

(g) "Unleaded gasoline" means gasoline containing not more than 0.05 gram of lead per gallon and not more than 0.005 gram of phosphorus per gallon.

(h) "Refinery" means a plant at which gasoline is produced.

(i) "Refiner" means any person who owns, leases, operates, controls, or supervises a refinery.

(j) "Retail outlet" means any establishment at which gasoline is sold or offered for sale for use in motor vehicles.

(k) "Retailer" means any person who owns, leases, operates, controls, or supervises a retail outlet.

(l) "Distributor" means any person who transports or stores or causes the transportation or storage of gasoline at any point between any gasoline refinery and any retail outlet or wholesale-purchaser-consumer's facilities.

(m) "Lead additive manufacturer" means any person who produces a lead additive or sells a lead additive under his own name.

(n) "Reseller" means any person who purchases gasoline identified by the corporate, trade, or brand name of a refiner from such refiner or a distributor and resells or transfers it to retailers or wholesale purchaser-consumers displaying the refiner's brand, and whose assets or facilities are not substantially owned, leased, or controlled by such refiner.

(o) "Wholesale purchaser-consumer" means any organization that is an ultimate consumer of gasoline and which purchases or obtains gasoline from a supplier for use in motor vehicles and receives delivery of that product into a storage tank of at least 550-gallon capacity substantially under the control of that organization.

(p) "Small refinery" means a refinery

(1) Which has a crude oil or bona fide feed stock capacity of 50,000 barrels per day or less, and

(2) Which is not owned or controlled by any refiner with a total combined crude oil or bona fide feed stock capacity greater than 137,500 barrels per day.

(q) "Owned or controlled" means leased, operated, controlled, supervised, or in ten percent or greater part, owned.

(r) Crude oil or bona fide feed stock capacity means that crude oil or bona fide feed stock capacity certified by the Department of Energy, Office of Refining Operations.

(Sec. 211 (Sec. 223, Pub. L. 95-95, 91 Stat. 764, 42 U.S.C. 7545(g)) and sec. 301(a) (42 U.S.C. 7602(a), formerly 42 U.S.C. 1857g(a)) of the Clean Air Act as amended)

[38 FR 1255, Jan. 10, 1973, as amended at 38 FR 33741, Dec. 6, 1973; 39 FR 43283, Dec. 12, 1974; 44 FR 46277, Aug. 7, 1979]

EFFECTIVE DATE NOTE: At 44 FR 46277, Aug. 7, 1979, paragraphs (p), (q), and (r) were added to § 80.2. The regulations apply to the average lead content of gasoline produced by small refiners in the fourth quarter of 1979, beginning on October 1, 1979. These regulations expire on October 1, 1982.

§ 80.3 Test methods.

The lead and phosphorus content of gasoline shall be determined in accordance with test methods set forth in the Appendices to this part.

[47 FR 765, Jan. 7, 1982]

§ 80.4 Right of entry; tests and inspections.

The Administrator, the Regional Administrator or his authorized representative, upon presentation of appropriate credentials shall have a right to enter upon or through any retail outlet, wholesale-purchaser-consumer facility, or the premises or property of any distributor, and shall have the right to make inspections, take samples, and conduct tests to determine compliance with this part of the Act.

[39 FR 43283, Dec. 12, 1974]

§ 80.5 Penalties.

Any person who violates these regulations shall forfeit and pay to the United States a civil penalty of $10,000 for each and every day of the continuance of such violation, which shall accrue to the United States and be recovered in a civil suit in the name of the United States, brought in the district where such person has his principal office or any district in which he does business. The Administrator may, upon application by the person against whom any such penalty has been as-

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sessed, remit or mitigate any such forfeiture. The Administrator shall have authority to determine the facts upon all such applications.

§ 80.7 Requests for information.

(a) When the Administrator, the Regional Administrator, or their delegates have reason to believe a violation of section 211(c) of the Act and the regulations thereunder has occurred, they may require any refiner, distributor, wholesale purchaser-consumer, or retailer to report the following information regarding receipt, transfer, delivery, or sale of gasoline represented to be unleaded gasoline and to allow the reproduction of such information at all reasonable times.

(1) For any bulk shipment of gasoline represented to be unleaded gasoline which is transferred, sold, or delivered within the previous 6 months by a refiner or a distributor to a distributor, wholesale purchaser-consumer or a retail outlet, the refiner or distributor shall maintain and provide the following information as applicable:

(i) Business or corporate name and address of distributors, wholesale purchaser-consumers or retail outlets to which the gasoline has been transferred, sold, or delivered.

(ii) Quantity of gasoline involved.

(iii) Date of delivery.

(iv) Storage location of gasoline prior to transit via delivery vessel (e.g., location of a bulk terminal).

(v) Business or corporate name and address of the person who delivered the gasoline.

(vi) Identification of delivery vessel (e.g., truck number). This information shall be supplied by the person in paragraph (a)(1)(v) of this section who performed the delivery, e.g., common or contract carrier.

(2) For any bulk shipment of gasoline represented to be unleaded gasoline received by a retail outlet or a wholesale-purchaser-consumer facility within the previous 6 months, whether by purchase or otherwise, the retailer or wholesale purchaser-consumer shall maintain accessibility to and provide the following information:

(i) Business or corporate name and address of the distributor.

(ii) Quantity of gasoline received.

(iii) Date of receipt.

(b) Upon request by the Administrator, the Regional Administrator, or their delegates, any retailer shall provide documentation of his annual total sales volume in gallons of gasoline for each retail outlet for each calendar year beginning with 1971.

(c) Any refiner, distributor, wholesale purchaser-consumer or retailer shall provide such other information as the Administrator, the Regional Administrator, or their delegates may reasonably require to enable him to determine whether such refiner, distributor, wholesale purchaser-consumer and retailer has acted or is acting in compliance with section 211(c) of the Act and the regulations thereunder and shall, upon the request of the Administrator, the Regional Administrator, or their delegates, produce and allow reproduction of any relevant records at all reasonable times. Such information may include but is not limited to records of unleaded gasoline inventory at a wholesale purchaser-consumer facility or a retail outlet, unleaded pump meter readings at a wholesale purchaser-consumer facility or a retail outlet, and receipts providing the date of acquisition of signs, labels, and nozzles required by § 80.22. No person shall be required to furnish information requested under this paragraph if he can establish that such information is not maintained in the normal course of his business.

(Secs. 211, 301, Clean Air Act as amended (42 U.S.C. 1857f-6c, 1857g))

[40 FR 36336, Aug. 20, 1975, as amended at 42 FR 45307, Sept. 9, 1977]

Subpart B—Controls and Prohibitions

§ 80.20 Controls applicable to gasoline refiners.

(a)(1) In the manufacture of gasoline at any refinery, no gasoline refiner shall exceed the average lead content per gallon specified below for each 3-month period (January through March, April through June, July through September, October through December):

(i) 0.8 gram of lead per gallon, after January 1, 1978, except as provided in paragraph (a)(4) of this section.

(ii) 0.5 gram of lead per gallon after October 1, 1979, except as provided in paragraph (a)(6) of this section.

(2) For each 3-month period (January through March, April through June, July through September, October through December) the average lead content per gallon shall be computed by dividing total grams of lead used at a refinery in the manufacture of gasoline by total gallons of gasoline manufactured at such refinery.

(3) For each 3-month period (January through March, April through June, July through September, October through December) commencing with the period January 1, 1975 through March 31, 1975, each refiner shall submit to the Administrator a report showing for each refinery (i) the total grams of lead in lead additive inventory on the first day of the period, (ii) the total grams of lead received during the period, (iii) the total grams of lead in lead additive inventory on the last day of the period, (iv) the total gallons of gasoline produced by such refinery during the period, and (v) the average lead content in each gallon of gasoline produced during the period. Reports shall be submitted within 15 days after the close of the reporting period, on forms supplied by the Administrator upon request.

(4)(i) The requirements of paragraph (a)(1)(i) of this section with respect to any refinery will be suspended conditioned upon a showing by the refiner that it has prior to January 1, 1978, made and is continuing to make reasonable good faith efforts to achieve compliance with the requirement of (a)(1)(i) of this section at the earliest practicable date after January 1, 1978, and compliance with the requirement of (a)(1)(ii) of this section on or before October 1, 1979.

(ii) To make the showing required by paragraph (a)(4)(i) of this section, the refiner is required to demonstrate that it has taken and is continuing to take sufficient actions at that refinery including procuring and installing equipment or entering into feedstock or blending component process and exchange agreements, or both, to achieve compliance with paragraph (a)(1) of this section. A refiner must submit not later than January 31, 1977, a schedule for achieving compliance with paragraph (a)(1) of this section at each of its refineries which will not comply with the 0.8 gram per gallon standard by January 1, 1978. The Administrator will determine whether a refiner's actions constitute reasonable good faith efforts by monitoring the refiner's adherence to that schedule.

(iii) If the refiner intends to achieve compliance with paragraph (a)(1) of this section wholly or partially by means of construction, the compliance schedule required to be submitted shall set forth the sequence and respective dates of all key events in the construction process including completion of plans and engineering drawings, ordering of equipment, receipt of equipment, signing of construction and other necessary contracts, commencement and completion of various phases of work, commencement and completion of testing, and any other similar events or dates.

(iv) If the refiner intends to achieve compliance with paragraph (a)(1) of this section wholly or partially through entering into and implementing feedstock or blending component process and exchange agreements, the compliance schedule required to be submitted shall describe the general content of such agreements and set forth the dates for entering into and implementing each such agreement.

(v) Where any refiner intends to achieve compliance with any provision of paragraph (a)(1) of this section by any reduction in gasoline production, or by a significant change in product mix at that refinery, the refiner shall so notify the Administrator in writing by December 31, 1976. Such notification shall set forth by product the projected levels to be attained for each quarter during the period commencing January 1, 1978, and ending December 31, 1979, which would be attained under these regulations, and the corresponding levels which would be attained in the absence of these regulations.

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(vi) The Administrator may require any refiner at any time after January 31, 1977, upon thirty days written notice, to submit such written reports, construction schedules, contracts, documents, and other information and evidence as the Administrator deems relevant to a determination of compliance with this regulation.

(vii) A refiner shall notify the Administrator in writing within ten days after the failure of the refiner to meet any increment of progress on the compliance schedule submitted.

(5) Until October 1, 1982, the provisions of paragraphs (a)(1) and (a)(4) of this section shall not apply to any small refinery, as defined in § 80.2(p).

(6) The provisions of paragraph (a)(1)(ii) of this section will not apply to any refinery for which a refiner submits a valid registration form to be received by September 19 indicating a commitment to a 0.8 gram per gallon standard by October 1, 1979, and a 0.5 gram per gallon standard by October 1, 1980 or submits 30 days prior to the beginning of the quarter for which the refiner wishes the 0.8 gram per gallon standard to become effective, a valid registration form for which such a commitment is made. The Administrator may, if the registration form is unclear, incomplete, or otherwise inadequate, notify the refiner that the registration is invalid. If the Administrator has not so notified the refiner by October 1, 1979, or within 30 days of receipt of the registration form for any quarter beginning January 1, 1980, the registration will be deemed complete. A registration form must contain the following information to be considered valid:

(i) Name, location and crude capacity in barrels per calendar day (bpcd) (as certified by the Department of Energy, Office of Refinery Operations) of each refinery owned or controlled by the refiner which is to be registered,

(ii) For each quarter October 1, 1978, through June 30, 1979, the following information for each refinery to be registered and the aggregate for those refineries to be registered:

Total gasoline production (bpcd)
Unleaded gasoline production (bpcd) (all grades)
Octane of unleaded gasoline (RON[1], AKI[2]) (all grades)
Unleaded gasoline production as a percentage of total gasoline production

(iii) For each quarter October 1, 1979, through September 30, 1980, assuming compliance with a 0.8 gpg standard, the following information for each refinery to be registered and the aggregate for those refineries to be registered:

Projected total gasoline production (bpcd)
Projected unleaded gasoline production (bpcd) (all grades)
Projected octane of unleaded gasoline (RON, AKI) (all grades)
Projected unleaded gasoline as a percentage of total gasoline production

(7) In the manufacture of gasoline, no gasoline refiner who has submitted a valid registration form for refineries in accordance with paragraph (a)(6) of this section, shall, in aggregate, at those registered refineries, produce unleaded gasoline as a percentage of total gasoline for the quarter beginning October 1, 1979 that is less than that percentage in the quarter beginning October 1, 1978, plus six (6) percentage points unless the production of unleaded gasoline as a percentage of total gasoline produced by the refiner in aggregate at registered refineries is greater than 45%.

(8) Each refiner who has submitted a valid registration form in accordance with paragraph (a)(6) of this section shall for each quarter July 1, 1979, through September 30, 1980, submit to the Administrator a report showing the following information for each registered refinery and in aggregate for all registered refineries:

Total gasoline production (bpcd)
Unleaded gasoline production (bpcd) (all grades)
Octane of unleaded gasoline (RON, AKI) (all grades)
Unleaded gasoline production as a percentage of total gasoline production.

Reports shall be submitted within 15 days after the close of the reporting period.

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[1] Ron means Research Octane Number
[2] AKI is (RON + MON)/2 where MON means motor octane number.

(9) In the manufacture of gasoline at any refinery for which a refiner has submitted a valid registration form in accordance with § 80.20(a)(6), no gasoline refiner shall exceed the average lead content specified below for each 3 month period:

(i) 0.8 gram of lead per gallon after October 1, 1979, or for each quarter for which a valid registration form is on file.

(ii) 0.5 gram of lead per gallon after October 1, 1980 and for quarters prior to this date for which a valid registration form is not on file.

(10) Any refiner may withdraw the registration for any or all of its registered refineries upon written notification to the Administrator. Once withdrawn, the refinery must comply with the 0.5 gram of lead per gallon standard for those quarters for which registration has been withdrawn and may not be reregistered for the 0.8 gram per gallon standard.

(b)(1) Gasoline manufactured at a small refinery shall not exceed the average lead content specified in the table below for any three month period (January through March, April through June, July through September, or October through December) beginning October 1, 1979, and ending with the three month period beginning July 1, 1982.

Barrels per calendar day [1]	Grams per gallon [2]
5,000 or under	2.65
5,001 to 10,000	2.15
10,001 to 15,000	1.65
15,001 to 20,000	1.30
Greater than 20,000	.80

[1]Preceding calendar year production rate of gasoline.
[2]Allowable average lead content of gasoline.

(2) For each small refinery, as defined in § 80.2(p), each refiner shall also submit reports as required in paragraph (a)(3) of this section.

(Sec. 211 (Sec. 223, Pub. L. 95-95, 91 Stat. 764, 42 U.S.C. 7545(g)) and sec. 301(a) (42 U.S.C. 7602(a), formerly 42 U.S.C. 1857g(a)) of the Clean Air Act as amended, secs. 211, 301, Clean Air Act, as amended (42 U.S.C 7545, 7601(a)))

[38 FR 33741, Dec. 6, 1973, as amended at 41 FR 42677, Sept. 28, 1976; 42 FR 55345, Dec. 20, 1976; 44 FR 46277, Aug. 7, 1979; 44 FR 53146, Sept. 12, 1979; 45 FR 55135, Aug. 18, 1980]

EFFECTIVE DATE NOTE: At 44 FR 46277, Aug. 7, 1979, paragraphs (a)(5) and (b) were added to § 80.20. The regulations apply to the average lead content of gasoline produced by small refiners in the fourth quarter of 1979, beginning on October 1, 1979. These regulations expire on October 1, 1982.

§ 80.21 Controls applicable to gasoline distributors.

(a) After July 1, 1974 no distributor shall sell or transfer to any distributor, retailer or wholesale purchaser-consumer any gasoline which he represents is unleaded unless such gasoline does, in fact, met the defined requirements for unleaded gasoline in § 80.2(g).

(b) No carrier or his employee or agent, whether operating under contract or tariff, shall cause unleaded gasoline tendered to the carrier for shipment or transfer to another carrier, distributor, or retailer to fail to comply, at the time of delivery, with the defined requirements for unleaded gasoline in § 80.2(g).

[39 FR 43283, Dec. 12, 1974, as amended at 40 FR 29292, July 11, 1975]

§ 80.22 Controls applicable to gasoline retailers and wholesale purchaser-consumers.

(a) After July 1, 1974 no retailer or his employee or agent and after January 31, 1975 no wholesale purchaser-consumer or his employee or agent shall sell, dispense, or offer for sale gasoline represented to be unleaded unless such gasoline meets the defined requirements for unleaded gasoline in § 80.2(g); nor shall he introduce, or cause or allow the introduction of leaded gasoline into any motor vehicle which is labeled "unleaded gasoline only," or which is equipped with a gasoline tank filler inlet which is designed for the introduction of unleaded gasoline.

(b) After July 1, 1974 every person who owns, leases, operates, controls or supervises one or more retail outlets with gasoline sales as described in paragraph (b)(1)(i) of this section or with gasoline sales and location as described in paragraph (b)(1)(ii) of this section shall offer for sale at each

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such retail outlet at least one grade of unleaded gasoline of not less than 91 Research Octane Number: *Provided, however,* That the octane number of unleaded gasoline offered for sale in areas where altitude is greater than 2,000 feet may be reduced one (1) octane number for each succeeding 1,000 feet, but not more than three (3) octane numbers in total.

(1) Unleaded gasoline must be offered for sale at each retail outlet:

(i) At which 200,000 or more gallons of gasoline were sold during any calendar year beginning with the year 1971;

(ii) At which 150,000 or more gallons of gasoline were sold during any calendar year beginning with the year 1971 if such retail outlet is located in a county containing a population density of less than 50 persons per square mile according to statistical data from the 1970 census of population and calculated by excluding cities[2] containing populations of 50,000 or more persons, unless such retail outlet is located in a city of 10,000 or more persons.

(2) Any retailer may defer compliance with paragraph (b)(1)(ii) of this section until January 31, 1975. However, if a retailer subject to paragraph (b)(1)(ii) of this section offers for sale unleaded gasoline at such outlet prior to that date, the retailer shall comply with all applicable provisions of these regulations.

(c) Time extensions or exemptions to these regulations may be granted upon conformance with the following conditions: (1) Any retailer may obtain an exemption from paragraph (b) of this section for outlets at which business will be terminated by January 1, 1975. In order to obtain this exemption, the retailer must present evidence to the Regional Administrator of specific termination plans for each such outlet. Any retailer granted this exemption for a specified outlet(s) who offers for sale unleaded gasoline at such outlet after July 1, 1974, but before January 1, 1975, shall inform the Regional Administrator in writing of such an offering and shall be expected to comply with all applicable provisions of these regulations.

(2) Any retailer may obtain a time extension for compliance with paragraph (b) of this section until September 1, 1974, for outlets at which equipment procurement delays will preclude compliance with these regulations. The extension is limited to a retailer who can present evidence to the Regional Administrator, upon his request, that the equipment was ordered in a timely manner but delivery was delayed for reasons beyond the control of the retail outlet owner and an attempt to procure equipment from alternative sources was made promptly by the owner upon receipt of notice of the delay.

(3) The Regional Administrator or his authorized representative may grant a time extension to any retailer to defer compliance with paragraph (b)(1)(ii) of this section upon a showing that

(i) Compliance with this section within that period of time would result in an inability to continue in business or would result in severe economic hardship,

(ii) Additional time is necessary to procure a nozzle spout as described in § 80.22(f)(2), or

(iii) Additional time is necessary to prepare existing storage tanks to dispense unleaded gasoline and to offer unleaded gasoline for sale.

Time extensions under paragraph (c)(3)(i) may be granted for a period of time of up to six months. Time extensions under paragraphs (c)(3) (ii) and (iii) may be granted for a period of time of up to two months. Any extension under paragraph (c)(3) may be renewed by the Regional Administrator or his authorized representative upon a showing that the retailer continues to qualify for an extension.

(4) All applications for exemptions or time extensions under paragraphs (c)(1), (c)(2) and (c)(3) of this section shall state the name and address of the applicant and address of the retail outlet and shall be sent to the appropriate Regional Administrator, or his authorized representative, of the Environmental Protection Agency in the EPA region in which the retail outlet is located. Time extensions to the reg-

[2] "City" means a political subdivision of a State within a defined area over which a municipal corporation has been established to provide local government functions and facilities.

ulations pursuant to paragraph (c)(3) may be granted upon conformance with the following conditions:

(i) Any retailer requesting a time extension under paragraph (c)(3)(i) of this section shall contact the Regional Administrator or his authorized representative in his region who will inform the applicant of the documentation required to support his request for an extension.

(ii) Any retailer requesting a time extension under paragraph (c)(3)(ii) of this section shall present to the Regional Administrator or his authorized representative, upon his request, evidence that the equipment was ordered in a timely manner but delivery was delayed for reasons beyond the control of the retailer, and an attempt to procure equipment from an alternative source was made promptly and continues to be made by the retailer upon receipt of the notice of the delay.

(iii) Any retailer requesting a time extension under paragraph (c)(3)(iii) of this section shall present to the Regional Administrator or his authorized representative, upon his request, evidence that unleaded gasoline was ordered in a timely manner but delivery was delayed for reasons beyond the control of the retailer, and an attempt to procure unleaded gasoline from an alternative source was made promptly by the retailer upon receipt of notice of the delay, and continues to be made (including an active application for the assignment of a supplier on file with his regional Federal Energy Administration Office).

A listing of the addresses of the Environmental Protection Agency regional offices follows:

I. John F. Kennedy Federal Building, Room 2203, Boston, Massachusetts 02203.

II. 26 Federal Plaza, Room 908, New York, New York 10007.

III. Curtis Building, 6th & Walnut Streets, Philadelphia, Pennsylvania 19106.

IV. 1421 Peachtree Street, N.E., Atlanta, Georgia 30309.

V. 230 South Dearborn Street, Chicago, Illinois.

VI. 1600 Patterson Street, Suite 1100, Dallas, Texas 75201.

VII. 1735 Baltimore Avenue, Kansas City, Missouri 64108.

VIII. 1860 Lincoln Street, Suite 900, Denver, Colorado 80203.

IX. 100 California Street, San Francisco, California 94111.

X. 1200 6th Avenue, Seattle, Washington 98101.

(d) After July 1, 1974 every retailer shall prominently and conspicuously display in the immediate area of each gasoline pump stand, and after January 31, 1975 every wholesale purchaser-consumer shall prominently and conspicuously display in the immediate area of each pump stand, the following notice:

Federal law prohibits the introduction of any gasoline containing lead or phosphorus into any motor vehicle labeled "UNLEADED GASOLINE ONLY." Such notice shall be no smaller than 36-point bold type and shall be located so as to be readily visible to the retailer's or wholesale purchaser-consumer's employees and persons operating vehicles into which gasoline is to be dispensed.

(e) After July 1, 1974 every retailer shall affix to each gasoline pump stand a permanent legible label, and after January 31, 1975 every wholesale purchaser-consumer shall affix to each gasoline pump stand a permanent legible label as follows:

(1) For gasoline pump stands containing pumps for introduction of unleaded gasoline into motor vehicles, the label shall state: Unleaded gasoline.

(2) For gasoline pump stands containing pumps for introduction of leaded gasoline into motor vehicles, the label shall state: Contains lead anti-knock compounds. Any label required under this paragraph shall be located so as to be readily visible to the retailer's or wholesale purchaser-consumer's employees and persons operating motor vehicles into which gasoline is to be dispensed.

(f) After July 1, 1974 every retailer shall equip all gasoline pumps, and after January 31, 1975 every wholesale purchaser-consumer shall equip all gasoline pumps as follows:

(1) Each pump from which leaded gasoline is introduced into motor vehicles shall be equipped with a nozzle spout having a terminal end with an outside diameter of not less than 0.930 inch (2.363 centimeters).

(2) Each pump from which unleaded gasoline is introduced into motor vehi-

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cles shall be equipped with a nozzle spout which meets the following specifications:

(i) The outside diameter of the terminal end shall not be greater than 0.840 inch (2.134 centimeters);

(ii) The terminal end shall have a straight section of at least 2.5 inches (6.34 centimeters) in length; and

(iii) The retaining spring shall terminate 3.0 inches (7.6 centimeters) from the terminal end.

(g) If more than one grade of gasoline is dispensed from a gasoline pump or pump stand, the Administrator may grant an exception to paragraph (e) or (f) of this section where it has been demonstrated to his satisfaction that an alternate system of labeling or equipment will comply with the objectives of paragraph (e) or (f) of this section.

(h) If more than one grade of unleaded gasoline is offered for sale at a retail outlet covered by these regulations, compliance with paragraph (e) or (f) of this section is required for only one grade.

(i) An exemption to paragraph (b) of this section is provided for any retail outlet which is otherwise required to carry a grade of unleaded gasoline and which has sold less than 100,000 gallons of gasoline to light duty motor vehicles in the year 1971 and in each subsequent year.

[38 FR 1255, Jan. 10, 1973, as amended at 39 FR 16125, May 17, 1974; 39 FR 43283, Dec. 12, 1974]

§ 80.23 Liability for violations.

Liability for violations of paragraph (a) of § 80.22 shall be determined as follows:

(a) (1) Where the corporate, trade, or brand name of a gasoline refiner or any of its marketing subsidiaries appears on the pump stand or is displayed at the retail outlet or wholesale purchaser-consumer facility from which the gasoline was sold, dispensed, or offered for sale, the retailer or wholesale purchaser-consumer, the reseller (if any), and such gasoline refiner shall be deemed in violation. Except as provided in paragraph (b)(2) of this section, the refiner shall be deemed in violation irrespective of whether any other refiner, distributor, retailer, or wholesale purchaser-consumer or the employee or agent of any refiner, distributor, retailer, or wholesale purchaser-consumer may have caused or permitted the violation.

(2) Where the corporate, trade, or brand name of a gasoline refiner or any of its marketing subsidiaries does not appear on the pump stand and is not displayed at the retail outlet or wholesale purchaser-consumer facility from which the gasoline was sold, dispensed, or offered for sale, the retailer or wholesale purchaser-consumer and any distributor who sold that person gasoline contained in the storage tank which supplied that pump at the time of the violation shall be deemed in violation.

(b)(1) In any case in which a retailer or wholesale purchaser-consumer and any gasoline refiner or distributor would be in violation under paragraphs (a) (1) or (2) of this section, the retailer or wholesale purchaser-consumer shall not be liable if he can demonstrate that the violation was not caused by him or his employee or agent.

(2) In any case in which a retailer or wholesale purchaser-consumer, a reseller (if any), and any gasoline refiner would be in violation under paragraph (a)(1) of this section, the refiner shall not be deemed in violation if he can demonstrate:

(i) That the violation was not caused by him or his employee or agent, and

(ii) That the violation was caused by an act in violation of law (other than the Act or this part), or an act of sabotage, vandalism, or deliberate commingling of leaded and unleaded gasoline, whether or not such acts are violations of law in the jurisdiction where the violation of the requirements of this part occurred, or

(iii) That the violation was caused by the action of a reseller or a retailer supplied by such reseller, in violation of a contractual undertaking imposed by the refiner on such reseller designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(iv) That the violation was caused by the action of a retailer who is supplied

directly by the refiner (and not by a reseller), in violation of a contractual undertaking imposed by the refiner on such retailer designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(v) That the violation was caused by the action of a distributor subject to a contract with the refiner for transportation of gasoline from a terminal to a distributor, retailer or wholesale purchaser-consumer, in violation of a contractual undertaking imposed by the refiner on such distributor designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(vi) That the violation was caused by a distributor (such as a common carrier) not subject to a contract with the refiner but engaged by him for transportation of gasoline from a terminal to a distributor, retailer or wholesale purchaser-consumer, despite reasonable efforts by the refiner (such as specification or inspection of equipment) to prevent such action, or

(vii) That the violation occurred at a wholesale purchaser-consumer facility: *Provided, however,* That if such wholesale purchaser-consumer was supplied by a reseller, the refiner must demonstrate that the violation could not have been prevented by such reseller's compliance with a contractual undertaking imposed by the refiner on such reseller as provided in paragraph (b)(2)(iii) of this section.

(viii) In paragraphs (b)(2)(ii) through (vi) hereof, the term "was caused" means that the refiner must demonstrate by reasonably specific showings by direct or circumstantial evidence that the violation was caused or must have been caused by another.

(c) In any case in which a retailer or wholesale purchaser-consumer, a reseller, and any gasoline refiner would be in violation under paragraph (a)(1) of § 80.23, the reseller shall not be deemed in violation if he can demonstrate that the violation was not caused by him or his employee or agent.

(d) In any case in which a retailer or wholesale purchaser-consumer and any gasoline distributor would be in violation under paragraph (a)(2) of this section, the distributor will not be deemed in violation if he can demonstrate that the violation was not caused by him or his employee or agent.

(e)(1) In any case in which a retailer or his employee or agent or a wholesale purchaser-consumer or his employee or agent introduced leaded gasoline from a pump from which leaded gasoline is sold, dispensed, or offered for sale, into a motor vehicle which is equipped with a gasoline tank filler inlet designed for the introduction of unleaded gasoline, only the retailer or wholesale purchaser-consumer shall be deemed in violation.

(2) If a retailer or a wholesale purchaser-consumer establishes that the conduct referred to in paragraph (e)(1) of this section was in response to the requirements of a *bona fide* emergency (such as when the gasoline tank of a vehicle is almost empty and no unleaded gasoline is available within a several mile radius), the retailer or wholesale purchaser-consumer will not be deemed in violation: *Provided, however,* That the amount of leaded gasoline which was introduced into the vehicle was limited to no more than was reasonably required to alleviate the circumstances of the particular emergency situation.

(Secs. 211, 301 of the Clean Air Act, as amended (42 U.S.C. 1857f-6c, 1857g))

[38 FR 1255, Jan. 10, 1973, as amended at 39 FR 42360, Dec. 5, 1974; 39 FR 43284, Dec. 12, 1974; 42 FR 45307, Sept. 9, 1977]

§ 80.24 Controls applicable to motor vehicle manufacturers.

The manufacturer of any motor vehicle equipped with an emission control device which the Administrator has determined will be significantly impaired by the use of leaded gasoline shall:

(a) Affix two or more permanent legible labels reading "Unleaded Gasoline Only" to such vehicle at the time of its manufacture, as follows:

(1) One label shall be located on the instrument panel so as to be readily

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visible to the operator of the vehicle: *Provided, however,* That the required statement may be incorporated into the design of the instrument panel rather than provided on a separate label; and

(2) One label shall be located immediately adjacent to each gasoline filler tank inlet, outside of any filler inlet compartment, and shall be located so as to be readily visible to any person introducing gasoline to such filler inlet: *Provided, however,* That the Administrator may, upon application from a motor vehicle manufacturer, approve other label locations that achieve the purpose of this paragraph.

(3) Such labels shall be in the English language in block letters which shall be of a color that contrasts with their background.

(b) Manufacture such vehicle with each gasoline tank filler inlet having a restriction which prevents the insertion of a nozzle with a spout as described in § 80.22(f)(1) and allows the insertion of a nozzle with a spout as described in § 80.22(f)(2).

(1) Such filler inlet shall be designed to pass not more than 700 c.c. of gasoline into the tank when the introduction of gasoline into such filler inlet is attempted from a nozzle, as described in § 80.22(f)(1), which has a vacuum port the center of which is located within 0.87 inches of the tip and which passes less than 120 c.c. of fuel when fully and rapidly activated with the nozzle vacuum port plugged. During such attempted introduction, the nozzle shall be inserted such that its automatic shutoff vacuum port is at various depths within the filler inlet, except those locations which cause fuel spillage (not including splash back) outside the filler inlet shall not be used. The nozzle may have any orientation within the filler inlet which may reasonably be expected to be encountered in use. The nozzle valve shall be fully and rapidly opened to a 8 ± 1 gallon/minute flow setting. This test is conducted using a test fixture which positions the filler inlet pipe in the same position as it is installed in the vehicle.

(c) For purposes of this section a motor vehicle shall be deemed to be equipped with an emission control device which will be significantly impaired by the use of leaded gasoline if unleaded gasoline was used in any testing or service accumulation under Part 86 relating to the emission certification of said motor vehicles or engine installed therein.

[38 FR 26450, Sept. 21, 1973, as amended at 39 FR 34538, Sept. 26, 1974; 46 FR 50472, Oct. 13, 1981]

§ 80.25 Controls applicable to lead additive manufacturers.

For each 3-month period (January through March, April through June, July through September, October through December) commencing with the period January 1, 1975 through March 31, 1975, each lead additive manufacturer shall submit to the Administrator a report showing the total grams of lead shipped to each refinery by such lead additive manufacturer during the period. Reports shall be submitted within 15 days after the close of the reporting period, on forms supplied by the Administrator upon request.

[38 FR 33741, Dec. 6, 1973]

§ 80.26 Confidentiality of information.

Information obtained by the Administrator or his representatives pursuant to this part shall be treated, in so far as its confidentiality is concerned, in accordance with the provisions of 40 CFR Part 2.

[38 FR 33741, Dec. 6, 1973]

Appendix A—Test for the Determination of Phosphorus in Gasoline

1. *Scope.* 1.1 This method was developed for the determination of phosphorus generally present as pentavalent phosphate esters or salts, or both, in gasoline. This method is applicable for the determination of phosphorus in the range from 0.0008 to 0.15 g P/U.S. gal, or 0.2 to 49 mg P/liter.

2. *Applicable documents.* 2.1 ASTM Standards:

D 1100 Specification for Filter Paper for Use in Chemical Analysis.

3. *Summary of method.* 3.1 Organic matter in the sample is decomposed by ignition in the presence of zinc oxide. The residue is dissolved in sulfuric acid and reacted with ammonium molybdate and hydrazine sul-

fate. The absorbance of the "Molybdenum Blue" complex is proportional to the phosphorus concentration in the sample and is read at approximately 820 nm in a 5-cm cell.

4. *Apparatus.* 4.1 Buret, 10-ml capacity, 0.05-ml subdivisions.

4.2 Constant-Temperature Bath, equipped to hold several 100-ml volumetric flasks submerged to the mark. Bath must have a large enough reservoir or heat capacity to keep the temperature at 180 to 190° F (82.2 to 87.8° C) during the entire period of sample heating.

NOTE 1: If the temperature of the hot water bath drops below 180° F (82.2° C) the color development may not be complete.

4.3 Cooling Bath, equipped to hold several 100-ml volumetric flasks submerged to the mark in ice water.

4.4 Filter Paper, for quantitative analysis, Class G for fine precipitates as defined in Specification D 1100.

4.5 Ignition Dish—Coors porcelain evaporating dish, glazed inside and outside, with pourout (size no. 00A, diameter 75 mm, capacity 70 ml).

4.6 Spectrophotometer, equipped with a tungsten lamp, a red-sensitive phototube capable of operating at 830 nm and with absorption cells that have a 5-cm light path.

4.7 Thermometer, range 50 to 220° F (10 to 105° C).

4.8 Volumetric Flask, 100-ml with ground-glass stopper.

4.9 Volumetric Flask, 1000-ml with ground-glass stopper.

4.10 Syringe, Luer-Lok, 10-ml equipped with 5-cm, 22-gage needle.

5. *Reagents.* 5.1 Purity of Reagents—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 Purity of Water—Unless otherwise indicated, references to water shall be understood to mean distilled water or water of equal purity.

5.3 Ammonium Molybdate Solution—Using graduated cylinders for measurement add slowly (Note 2), with continuous stirring, 225 ml of concentrated sulfuric acid to 500 ml of water contained in a beaker placed in a bath of cold water. Cool to room temperature and add 20 g of ammonium molybdate tetrahydrate ($(NH_4)_6Mo_7O_{24}\cdot 4H_2O$). Stir until solution is complete and transfer to a 1000-ml flask. Dilute to the mark with water.

NOTE 2: Wear a face shield, rubber gloves, and a rubber apron when adding concentrated sulfuric acid to water.

5.4 Hydrazine Sulfate Solution—Dissolve 1.5 of hydrazine sulfate ($H_2NNH_2\cdot H_2SO_4$) in 1 litre of water, measured with a graduated cylinder.

NOTE 3: This solution is not stable. Keep it tightly stoppered and in the dark. Prepare a fresh solution after 3 weeks.

5.5 Molybdate-Hydrazine Reagent—Pipet 25 ml of ammonium molybdate solution into a 100-ml volumetric flask containing approximately 50 ml of water, add by pipet 10 ml of $N_2NNH_2\cdot H_2SO_4$ solution, and dilute to 100 ml with water.

NOTE 4: This reagent is unstable and should be used within about 4 h. Prepare it immediately before use. Each determination (including the blank) uses 50 ml.

5.6 Phosphorus, Standard Solution (10.0 μg P/ml)—Pipet 10 ml of stock standard phosphorus solution into a 1000-ml volumetric flask and dilute to the mark with water.

5.7 Phosphorus, Stock Standard Solution (1.00 mg P/ml)—Dry approximately 5 g of potasium dihydrogen phosphate (KH_2PO_4 in an oven at 221 to 230° F (105 to 110° C) for 3 h. Dissolve 4.393±0.002 g of the reagent in 150 ml, measured with a graduated cylinder, of H_2SO_4(1+10) contained in a 1000-ml volumetric flask. Dilute with water to the mark.

5.8 Sulfuric Acid (1+10)—Using graduated cylinders for measurement add slowly (Note 2), with continuous stirring, 100-ml of concentrated sulfuric acid (H_2SO_4, sp gr 1.84) to 1 litre of water contained in a beaker placed in a bath of cold water.

5.9 Zinc Oxide.

NOTE 5: High-bulk density zinc oxide may cause spattering. Density of approximately 0.5 g/cm^3 has been found satisfactory.

6. *Calibration.* 6.1 Transfer by buret, or a volumetric transfer pipet, 0.0, 0.5, 1.0, 1.5, 2.0, 3.0, 3.5, and 4.0 ml of phosphorus standard solution into 100-ml volumetric flasks.

6.2 Pipet 10 ml of H_2SO_4 (1+10) into each flask. Mix immediately by swirling.

6.3 Prepare the molybdate-hydrazine solution. Prepare sufficient volume of reagent based on the number of samples being analyzed.

6.4 Pipet 50 ml of the molybdate-hydrazine solution to each volumetric flask. Mix immediately by swirling.

6.5 Dilute to 100 ml with water.

6.6 Mix well and place in the constant-temperature bath so that the contents of the flask are submerged below the level of the bath. Maintain bath temperature at 180 to 190° F (82.2 to 87.8° C) for 25 min (Note 1).

6.7 Transfer the flask to the cooling bath and cool the contents rapidly to room temperature. Do not allow the samples to cool

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more than 5° F (2.8° C) below room temperature.

NOTE 6: Place a chemically clean thermometer in one of the flasks to check the temperature.

6.8 After cooling the flasks to room temperature, remove them from the cooling water bath and allow them to stand for 10 min. at room temperature.

6.9 Using the 2.0-ml phosphorus standard in a 5-cm cell, determine the wavelength near 820 nm that gives maximum absorbance. The wavelength giving maximum absorbance should not exceed 830 nm.

6.9.1 Using a red-sensitive phototube and 5-cm cells, adjust the spectrophotometer to zero absorbance at the wavelength of maximum absorbance using distilled water in both cells. Use the wavelength of maximum absorbance in the determination of calibration readings and future sample readings.

6.9.2 The use of 1-cm cells for the higher concentrations is permissible.

6.10 Measure the absorbance of each calibration sample including the blank (0.0 ml phosphorus standard) at the wavelength of maximum absorbance with distilled water in the reference cell.

NOTE 7: Great care must be taken to avoid possible contamination. If the absorbance of the blank exceeds 0.04 (for 5-cm cell), check for source of contamination. It is suggested that the results be disregarded and the test be rerun with fresh reagents and clean glassware.

6.11 Correct the absorbance of each standard solution by subtracting the absorbance of the blank (0 ml phosphorus standard).

6.12 Prepare a calibration curve by plotting the corrected absorbance of each standard solution against micrograms of phosphorus. One millilitre of phosphorus standard solution provides 10 μg of phosphorus.

7. *Sampling.* 7.1 Selection of the size of the sample to be tested depends on the expected concentration of phosphorous in the sample. If a concentration of phosphorus is suspected to be less than 0.0038 g/gal (1.0 mg/litre), it will be necessary to use 10 ml of sample.

NOTE 8: Two grams of zinc oxide cannot absorb this volume of gasoline. Therefore the 10-ml sample is ignited in aliquots of 2 ml in the presence of 2 g of zinc oxide.

7.2 The following table serves as a guide for selecting sample size:

Phosphorus, milligrams per liter	Equivalent, grams per gallon	Sample size, milliliter
2.5 to 40	0.01 to 0.15	1.00
1.3 to 20	0.005 to 0.075	2.00
0.9 to 13	0.0037 to 0.05	3.00
1 or less	0.0038 or less	10.00

8. *Procedure.* 8.1 Transfer 2±0.2 g of zinc oxide into a conical pile in a clean, dry, unetched ignition dish.

NOTE 9: In order to obtain satisfactory accuracy with the small amounts of phosphorus involved, it is necessary to take extensive precautions in handling. The usual precautions of cleanliness, careful manipulation, and avoidance of contamination should be scrupulously observed; also, all glassware should be cleaned before use, with cleaning acid or by some procedure that does not involve use of commercial detergents. These compounds often contain alkali phosphates which are strongly adsorbed by glass surfaces and are not removed by ordinary rinsing. It is desirable to segregate a special stock of glassware for use only in the determination of phosphorus.

8.2 Make a deep depression in the center of the zinc oxide pile with a stirring rod.

8.3 Pipet the gasoline sample (Note 10) (see 7.2 for suggested sample volume) into the depression in the zinc oxide. Record the temperature of the fuel if the phosphorus content is required at 60° F (15.6° C) and make correction as directed in 9.2.

NOTE 10: For the 10-ml sample use multiple additions and a syringe. Hold the tip of the needle at approximately ⅔ of the depth of the zinc oxide layer and slowly deliver 2 ml of the sample: fast sample delivery may give low results. Give sufficient time for the gasoline to be absorbed by the zinc oxide. Follow step 8.6. Cool the dish to room temperature. Repeat steps 8.3 and 8.6 until all the sample has been burned. Safety—cool the ignition dish before adding the additional aliquots of gasoline to avoid a flash fire.

8.4 Cover the sample with a small amount of fresh zinc oxide from reagent bottle (use the tip of a small spatula to deliver approximately 0.2 g). Tap the sides of the ignition dish to pack the zinc oxide.

8.5 Prepare the blank, using the same amount of zinc oxide in an ignition dish.

8.6 Ignite the gasoline, using the flame from a bunsen burner. Allow the gasoline to burn to extinction (NOTE 10).

8.7 Place the ignition dishes containing the sample and blank in a hot muffle furnace set at a temperature of 1150 to 1300° F (621 to 704° C) for 10 min. Remove and cool the ignition dishes. When cool gently tap the sides of the dish to loosen the zinc oxide. Again place the dishes in the muffle furnace for 5 min. Remove and cool the ignition dishes to room temperature. The above treatment is usually sufficient to burn the carbon. If the carbon is not completely burned off place the dish into the oven for further 5-min. periods.

NOTE 11: Step 8.7 may also be accomplished by heating the ignition dish with a Meker burner gradually increasing the intensity of heat until the carbon from the

sides of the dish has been burned, then cool to room temperature.

8.8 Pipet 25 ml of H_2SO_4 (1 + 10) to each ignition dish. While pipeting, carefully wash all traces of zinc oxide from the sides of the ignition dish.

8.9 Cover the ignition dish with a borosilicate watch glass and warm the ignition dish on a hot plate until the zinc oxide is completely dissolved.

8.10 Transfer the solution through filter paper to a 100-ml volumetric flask. Rinse the watch glass and the dish several times with distilled water (do not exceed 25 ml) and transfer the washings through the filter paper to the volumetric flask.

8.11 Prepare the molybdate-hydrazine solution.

8.12 Add 50 ml of the molybdate-hydrazine solution by pipet to each 100-ml volumetric flask. Mix immediately by swirling.

8.13 Dilute to 100 ml with water and mix well. Remove stoppers from flasks after mixing.

8.14 Place the 100-ml flasks in the constant-temperature bath for 25 min. so that the contents of the flasks are below the liquid level of the bath. The temperature of the bath should be 180 to 190° F (82.2 to 87.8° C) (NOTE 1).

8.15 Transfer the 100-ml flasks to the cooling bath and cool the contents rapidly to room temperature (NOTE 6).

8.16 Allow the samples to stand at room temperature before measuring the absorbance.

NOTE 12: The color developed is stable for at least 4 h.

8.17 Set the spectrophotometer to the wavelength of maximum absorbance as determined in 6.9. Adjust the spectrophotometer to zero absorbance, using distilled water in both cells.

8.18 Measure the absorbance of the samples at the wavelength of maximum absorbance with distilled water in the reference cell.

8.19 Subtract the absorbance of the blank from the absorbance of each sample (NOTE 7).

8.20 Determine the micrograms of phosphorous in the sample, using the calibration curve from 6.12 and the corrected absorbance.

9. *Calculations.* 9.1 Calculate the milligrams of phosphorus per litre of sample as follows:

$$P, \text{ mg/litre} = P/V$$

where:

P = micrograms of phosphorus read from calibration curve, and

V = millilitres of gasoline sample.

To convert to grams of phosphorus per U.S. gallon of sample, multiply mg P/litre by 0.0038.

9.2 If the gasoline sample was taken at a temperature other than 60°F (15.6°C) make the following temperature correction:

$$\text{mg P/litre at } 15.6\,^{\circ}\text{C} = [\text{mg P/litre at } t]\,[1 + 0.001\,(t - 15.6)]$$

where:

t = observed temperature of the gasoline, °C.

9.3 Concentrations below 2.5 mg/litre or 0.01 g/gal should be reported to the nearest 0.01 mg/litre or 0.0001 g/U.S. gal.

9.3.1 For higher concentrations, report results to the nearest 1 mg P/litre or 0.005 g P/U.S. gal.

10. *Precision.* 10.1 The following criteria should be used for judging the acceptability of results (95 percent confidence):

10.2 Repeatability—Duplicate results by the same operator should be considered suspect if they differ by more than the following amounts:

g P/U.S. gal (mg. P/litre)	Repeatability
0.0008 to 0.005 (0.2 to 1.3)	0.0002 g P/U.S. gal (0.05 mg P/litre).
0.005 to 0.15 (1.3 to 40)	7% of the mean.

10.3 Reproducibility—The results submitted by each of two laboratories should not be considered suspect unless they differ by more than the following amounts:

g P/U.S. gal (mg. P/litre)	Reproducibility
0.0008 to 0.005 (0.2 to 1.3)	0.0005 g P/U.S. gal (0.13 mg P/litre).
0.005 to 0.15 (1.3 to 40)	13% of the mean.

[39 FR 24891, July 8, 1974; 39 FR 25653, July 12, 1974]

APPENDIX B—TESTS FOR LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY

METHOD 1—STANDARD METHOD TEST FOR LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY

1. *Scope.* 1.1. This method covers the determination of the total lead content of gasoline. The procedure's calibration range is 0.010 to 0.10 gram of lead/U.S. gal. Samples above this level should be diluted to fall within this range or a higher level calibration standard curve must be prepared. The higher level curve must be shown to be linear and measurement of lead at these levels must be shown to be accurate by the analysis of control samples at a higher level of alkyl lead content. The method compen-

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sates for variations in gasoline composition and is independent of lead alkyl type.

2. *Summary of method.* 2.1 The gasoline sample is diluted with methyl isobutyl ketone and the alkyl lead compounds are stabilized by reaction with iodine and a quarternary ammonium salt. The lead content of the sample is determined by atomic absorption flame spectrometry at 2833 A, using standards prepared from reagent grade lead chloride. By the use of this treatment, all alkyl lead compounds give identical response.

3. *Apparatus.* 3.1 Atomic Absorption Spectometer, capable of scale expansion and nebulizer adjustment, and equipped with a slot burner and premix chamber for use with an air-acetylene flame.

3.2 Volumetric Flasks, 50-ml, 100-ml, 250-ml, and one litre sizes.

3.3 Pipets, 2-ml, 5-ml, 10-ml, 20-ml, and 50-ml sizes.

3.4 Micropipet, 100-μl, Eppendorf type or equivalent.

4. *Reagents.* 4.1 Purity of Reagents—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

4.2 Purity of Water—Unless otherwise indicated, references to water shall be understood to mean distilled water or water of equal purity.

4.3 Aliquat 336 (tricapryl methyl ammonium chloride).

4.4 Aliquat 336/MIBK Solution (10 percent v/v)—Dissolve and dilute 100 ml (88.0 g) of Aliquat 336 with MIBK to one liter.

4.5 Aliquat 336/MIBK Solution (1 percent v/v)—Dissolve and dilute 10 ml (8.8 g) of Aliquat 336 with MIBK to one liter.

4.6 Iodine Solution—Dissolve and dilute 3.0 g iodine crystals with Toluene to 100 ml.

4.7 Lead Chloride.

4.8 Lead-Sterile Gasoline—Gasoline containing less than 0.005 g Pb/gal.

4.9 Lead, Standard Solution (5.0 g Pb/gal)—Dissolve 0.4433 g of lead chloride ($PbCl_2$) previously dried at 105° C for 3 h in about 200 ml of 10 percent Aliquat 336/MIBK solution in a 250-ml volumetric flask. Dilute to the mark with the 10 percent Aliquat solution, mix, and store in a brown bottle having a polyethylene-lined cap. This solution contains 1,321 μg Pb/ml, which is equivalent to 5.0 g Pb/gal.

4.10 Lead, Standard Solution (1.0 g Pb/gal)—By means of a pipet, accurately transfer 50.0 ml of the 5.0 g Pb/gal solution to a 250-ml volumetric flask, dilute to volume with 1 percent Aliquat/MIBK solution. Store in a brown bottle having a polyethylene-lined cap.

4.11 Lead, Standard Solutions (0.02, 0.05, and 0.10 g Pb/gal)—Transfer accurately by means of pipets 2.0, 5.0, and 10.0 ml of the 1.0-g Pb/gal solution to 100-ml volumetric flasks; add 5.0 ml of 1 percent Aliquat 336 solution to each flask; dilute to the mark with MIBK. Mix well and store in bottles having polyethylene-lined caps.

4.12 Methyl Isobutyl Ketone (MIBK). (4-methyl-2-pentanone).

5. *Calibration.* 5.1 Preparation of Working Standards—Prepare three working standards and a blank using the 0.02, 0.05, and 0.10-g Pb/gal standard lead solutions described in 4.11.

5.1.1 To each of four 50-ml volumetric flasks containing 30 ml of MIBK, add 5.0 ml of low lead standard solution and 5.0 ml of lead-free gasoline. In the case of the blank, add only 5.0 ml of lead-free gasoline.

5.1.2 Add immediately 0.1 ml of iodine/toluene solution by means of the 100-μl Eppendorf pipet. Mix well.[1]

5.1.3 Add 5 ml of 1 percent Aliquat 336 solution and mix.

5.1.4 Dilute to volume with MIBK and mix well.

5.2 Preparation of Instrument—Optimize the atomic absorption equipment for lead at 2833 A. Using the reagent blank, adjust the gas mixture and the sample aspiration rate to obtain an oxidizing flame.

5.2.1 Aspirate the 0.1-g Pb/gal working standard and adjust the burner position to give maximum response. Some instruments require the use of scale expansion to produce a reading of 0.150 to 0.170 for this standard.

5.2.2 Aspirate the reagent blank to zero the instrument and check the absorbances of the three working standards for linearity.

6. *Procedure.* 6.1 To a 50 ml volumetric flask containing 30 ml MIBK, add 5.0 ml of gasoline sample and mix.[2]

6.1.1 Add 0.10 ml (100 μl) of iodine/toluene solution and allow the mixture to react about 1 min.[1]

6.1.2 Add 5.0 ml of 1 percent Aliquot 336/MIBK solution and mix.

6.1.3 Dilute to volume with MIBK and mix.

6.2 Aspirate the samples and working standards and record the absorbance values with frequent checks of the zero.

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[1] EPA practice will be to mix well by shaking vigorously for approximately one minute.

[2] The gasoline should be allowed to come to room temperature (25° C).

6.3 Any sample resulting in a peak greater than 0.05 g Pb/gal will be run in duplicate. Samples registering greater than 0.10 g Pb/gal should be diluted with iso-octane or unleaded fuel to fall within the calibration range or a higher level calibration standard curve must be prepared. The higher level curve must be shown to be linear and measurement of lead at these levels must be shown to be accurate by the analysis of control samples at a higher level of alkyl lead content.

7. *Calculations.* 7.1 Plot the absorbance values versus concentration represented by the working standards and read the concentrations of the samples from the graph.

8. *Precision.* 8.1 The following criteria should be used for judging the acceptability of results (95 percent confidence):

8.1.1 Repeatability—Duplicate results by the same operator should be considered suspect if they differ by more than 0.005 g/gal.

8.1.2 Reproductibility—The results submitted by each of two laboratories should not be considered suspect unless the two results differ by more than 0.01 g/gal.

METHOD 2—AUTOMATED METHOD TEST FOR LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY

1. *Scope and Application.* 1.1 This method covers the determination of the total lead content of gasoline. The procedure's calibration range is 0.010 to 0.10 gram of lead/U.S. gal. Samples above this level should be diluted to fall within this range or a higher level calibration standard curve must be prepared. The higher level curve must be shown to be linear and measurement of lead at these levels must be shown to be accurate by the analysis of control samples at a higher level of alkyl lead content. The method compensates for variations in gasoline composition and is independent of lead alkyl type.

1.2 This method may be used as an alternative to the Standard Method set forth above.

1.3 Where trade names or specific products are noted in the method, equivalent apparatus and chemical reagents may be used. Mention of trade names or specific products is for the assistance of the user and does not constitute endorsement by the U.S. Environmental Protection Agency.

2. *Summary of Method.* 2.1 The gasoline sample is diluted with methly isobutyl ketone (MIBK) and the alkyl lead compounds are stabilized by reacting with iodine and a quarternary ammonium salt. An automated system is used to perform the diluting and the chemical reactions and feed the products to the atomic absorption spectrometer with an air-acetylene flame.

2.2 The dilution of the gasoline with MIBK compensates for severe non-atomic absorption, scatter from unburned carbon containing species and matrix effects caused in part by the burning characteristics of gasoline.

2.3 The *in-situ* reaction of alkyl lead in gasoline with iodine eliminates the problem of variations in response due to different alkyl types by leveling the response of all alkyl lead compounds.

2.4 The addition of the quarternary ammonium salt improves response and increases the stability of the alkyl iodide complex.

3. *Sample Handling and Preservation.* 3.1 Samples should be collected and stored in containers which will protect them from changes in the lead content of the gasoline such as from loss of volatile fractions of the gasoline by evaporation or leaching of the lead into the container or cap.

3.2 If samples have been refrigerated they should be brought to room temperature prior to analysis.

4. *Apparatus.* 4.1 AutoAnalyzer system consisting of:

4.1.1 Sampler 20/hr cam, 30/hr cam.

4.1.2 Proportioning pump.

4.1.3 Lead in gas manifold.

4.1.4 Disposable test tubes.

4.1.5 Two 2-liter and one 0.5 liter Erlenmeyer solvent displacement flasks. Alternatively, high pressure liquid chromatography (HPLC) or syringe pumps may be used.

4.2 Atomic Absorption Spectroscopy (AAS) Detector System consisting of:

4.2.1 Atomic absorption spectrometer.

4.2.2 10" strip chart recorder.

4.2.3 Lead hollow cathode lamp or electrodeless discharge lamp (EDL).

5. *Reagents.* 5.1 Aliquat 336/MIBK solution (10% v/v): Dissolve and dilute 100 ml (88.0 g) of Aliquat 336 (Aldrich Chemical Co., Milwaukee, Wisconsin) with MIBK (Burdick & Jackson Lab., Inc., Muskegon, Michigan) to one liter.

5.2 Aliquat 336/iso-octane solution (1% v/v): Dissolve and dilute 10 ml (8.8 g) of Alquat 336 (reagent 5.1) with iso-octane to one liter.

5.3 Iodine solution (3% w/v): Dissolve and dilute 3.0 g iodine crystals (American Chemical Society) with toluene (Burdick & Jackson Lab., Inc., Muskegon, Michigan) to 100 ml.

5.4 Iodine working solution (0.24% w/v): Dilute 8 ml of reagent 5.3 to 100 ml with toluene.

5.5 Methyl isobutyl ketone (MIBK) (4-methlyl-2-pentanone).

5.6 Certified unleaded gasoline (Phillips Chemical Co., Borger, Texas) or iso-octane (Burdick & Jackson Lab, Inc., Muskegon, Michigan).

6. *Calibration Standards.* 6.1 Stock 5.0 g Pb/gal Standard:

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Dissolve 0.4433 gram of lead chloride ($PbCl_2$) previously dried at 105°C for 3 hours in 200 ml of 10% v/v Aliquat 336/MIBK solution (reagent 5.1) in a 250 ml volumetric flask. Dilute to volume with reagent 5.1 and store in an amber bottle.

6.2 Intermediate 1.0 g Pb/gal Standard:

Pipet 50 ml of the 5.0 g Pb/gal standard into a 250 ml volumetric flask and dilute to volume with a 1% v/v Aliquat 336/iso-octane solution (reagent 5.2). Store in an amber bottle.

6.3 Working 0.02, 0.05, 0.10 g Pb/gal Standards:

Pipet 2.0, 5.0, and 10.0 ml of the 1.0 g Pb/gal solution to 100 ml volumetric flasks. Add 5 ml of a 1% Aliquat 336/iso-octane solution to each flask. Dilute to volume with iso-octane. These solutions contain 0.02, 0.05, and 0.10 g Pb/gal in a 0.05% Aliquat 336/iso-octane solution.

7. *AAS Instrumental Conditions.* 7.1 Lead hollow cathode lamp.

7.2 Wavelength: 283.3 nm.

7.3 Slit: 4 (0.7mm).

7.4 Range: UV.

7.5 Fuel: Acetylene (approx. 20 ml/min at 8 psi).

7.6 Oxidant: Air (approx. 65 ml/min at 31 psi).

7.7 Nebulizer: 5.2 ml/min.

7.8 Chart speed: 10 in/hr.

8. *Procedures.* 8.1 AAS start-up.

8.1.1 Assure that instrumental conditions have been optimized and aligned according to Section 7 and the instrument has had substantial time for warm-up.

8.2 Auto Analyzer start-up [see figure 1].

8.2.1 Check all pump tubing and replace as necessary. Iodine tubing should be changed daily. All pump tubing should be replaced after one week of use. Place the platen on the pump.

8.2.2 Withdraw any water from the sample wash cup and fill with certified unleaded gasoline (reagent 5.6).

8.2.3 Fill the 2-liter MIBK dilution displacement Erlenmeyer flask (reagent 5.5) and the 0.5 liter Aliquat 336/MIBK 1% v/v (reagent 5.2) displacement flask and place the rubber stopper glass tubing assemblies in their respective flasks.

8.2.4 Fill a 2-liter Erlenmeyer flask with distilled water. The water will be used to displace the solvents. Therefore, place the appropriate lines in this flask. This procedure is not relevant if syringe pumps are used.

8.2.5 Fill the final debubbler reverse displacement 2-liter Erlenmeyer flask with distilled water and place the rubber stopper glass tubing assembly in the flask.

8.2.6 Place the appropriate lines for the iodine reagent (reagent 5.4) and the wash solution (reagent 5.6) in their respective bottles.

8.2.7 Start the pump and connect the aspiration line from the manifold to the AAS.

8.2.8 Some initial checks to assure that the reagents are being added are:

a. A good uniform bubble pattern.

b. Yellow color evident due to iodine in the system.

c. No surging in any tubing.

8.3 Calibration.

8.3.1 Turn the chart drive on and obtain a steady baseline.

8.3.2 Load standards and samples into sample tray.

8.3.3 Start the sampler and run the standards (Note: first check the sample probe positioning with an empty test tube).

8.3.4 Check the linearity of calibration standards response and slope by running a least squares fit. Check these results against previously obtained results. They should agree within 10%.

8.3.5 If the above is in control then start the sample analysis.

8.4 Sample Analysis.

8.4.1 To minimize gasoline vapor in the laboratory, load the sample tray about 5-10 test tubes ahead of the sampler.

8.4.2 Record the sample number on the strip chart corresponding to the appropriate peak.

8.4.3 Every ten samples run the high calibration standard and a previously analyzed sample (duplicate). Also let the sampler skip to check the baseline.

8.4.4 After an acceptable peak (within the calibration range) is obtained, pour the excess sample from the test tube into the waste gasoline can.

8.4.5 Any sample resulting in a peak greater than 0.05 g Pb/gal will be run in duplicate. Samples registering greater than 0.10 g Pb/gal should be diluted with iso-octane or unleaded fuel to fall within the calibration range or a higher level calibration standard curve must be prepared. The higher level curve must be shown to be linear and measurement of lead at these levels must be shown to be accurate by the analysis of control samples at a higher level of alkyl lead content.

8.5 Shut Down.

8.5.1 Replace the solvent displacement flask with flasks filled with distilled water. Also place all other lines in a beaker of distilled water. Rinse the system with distilled water for 15 minutes.

8.5.2 Withdraw the gasoline from the wash cup and fill with water.

8.5.3 Dispose of all solvent waste in waste glass bottles.

8.5.4 Turn the AAS off after extinguishing the flame. Also turn the recorder and pump off. Remove the platen and release the pump tubing.

8.5.5 shut the acetylene off at the tank and bleed the line.

9. *Quality Control.* 9.1 Precision.

9.1.1 All duplicate results should be considered suspect if they differ by more than 0.005 g Pb/gal.

9.2 Accuracy.

9.2.1 All quality control standard checks should agree within 10% of the nominal value of the standard.

9.2.2 All spikes should agree within 10% of the known addition.

10. *Past Quality Control Data.* 10.1 Precision.

10.1.1 Duplicate analysis for 156 samples in a single laboratory has resulted in an average difference of 0.00011 g Pb/gal with a standard deviation of 0.0023.

10.1.2 Replicate analysis in a single laboratory (greater than 5 determinations) of samples at concentrations of 0.010, 0.048, and 0.085 g Pb/gal resulted in relative standard deviations of 4.2%, 3.5%, and 3.3% respectively.

10.2 Accuracy.

10.2.1 The analysis of National Bureau of Standards (NBS) lead in reference fuel of known concentrations in a single laboratory has resulted in found values deviating from the true value for 11 determinations of 0.0322 g Pb/gal by an average of 0.56% with a standard deviation of 6.8%, for 15 determinations of 0.0519 g Pb/gal by an average of −1.1% with a standard deviation of 5.8%, and for 7 determinations of 0.0725 g Pb/gal by an average of 3.5% with a standard deviation of 4.8%.

10.2.2 Twenty-three analyses of blind reference samples in a single laboratory (U.S. EPA, RTP, N.C.) have resulted in found values differing from the true value by an average of −0.0009 g Pb/gal with a standard deviation of 0.004.

10.2.3 In a single laboratory, the average percent recovery of 108 spikes made to samples was 101% with a standard deviation of 5.6%.

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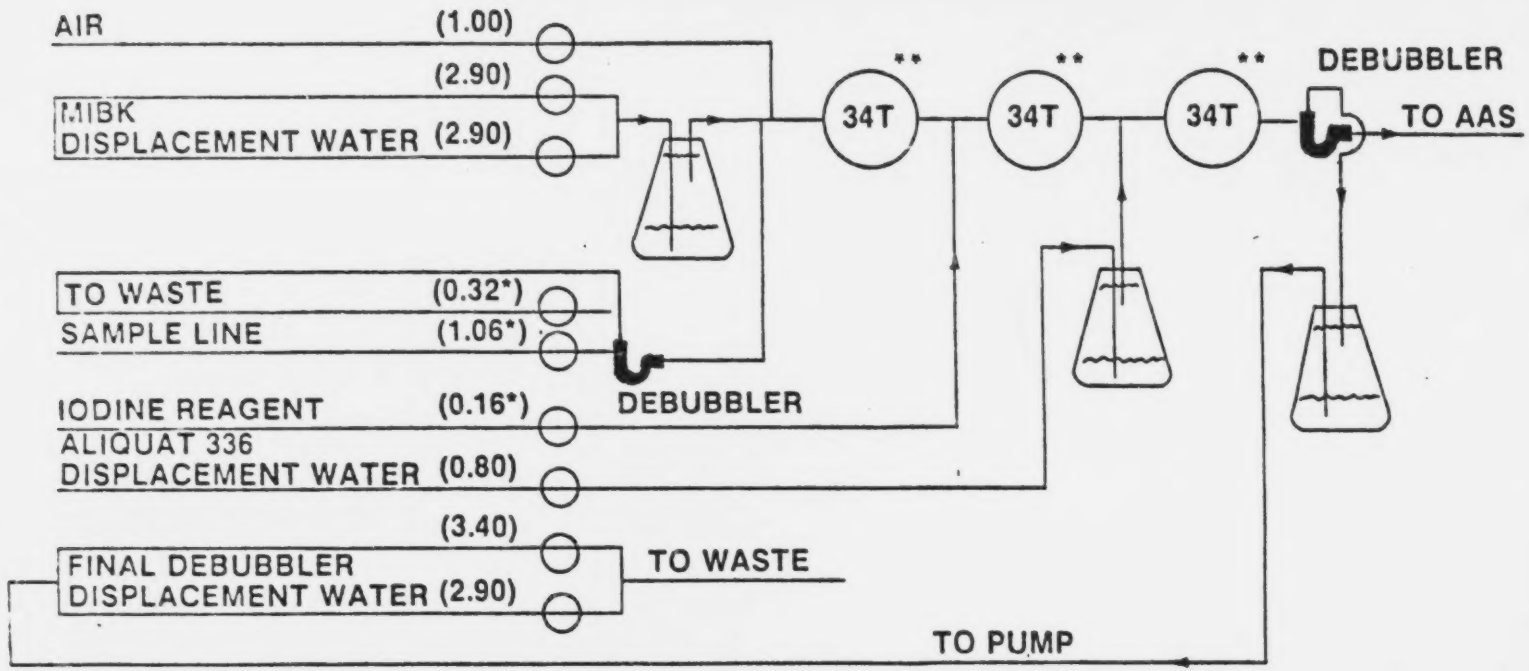

Figure 1

Flow Diagram for the Automated System. (*: Solvaflex pump tubing, **: Technicon part no. 157-0225) Numbers in parentheses refer to the flow rate (ml/min.).

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[39 FR 24891, July 8, 1974; 39 FR 25653, July 12, 1974; 39 FR 26287, July 18, 1974, as amended at 47 FR 765, Jan. 7, 1982]

Appendix C—List of Counties With Population Densities Less Than 50 Persons Per Square Mile (Excluding Cities With Populations Equal To or Greater Than 50,000 Persons)

State/County	Population [1]
Alabama:	
Autauga	41
Baldwin	38
Barbour	25
Bibb	22
Blount	42
Bullock	19
Butler	28
Cherokee	28
Chilton	36
Choctaw	18
Clarke	22
Clay	21
Cleburne	19
Conecuh	18
Coosa	16
Covington	35
Crenshaw	22
Escambia	36
Fayette	26
Franklin	37
Geneva	38
Greene	17
Hale	24
Henry	24
Jackson	36
La Mar	24
Lawrence	40
Lowndes	18
Macon	40
Marengo	24
Marion	32
Monroe	20
Montgomery	46
Perry	21
Pickens	23
Pike	37
Randolph	32
St. Clair	44
Selby	48
Sumter	19
Tallapoosa	45
Tuscaloosa	39
Washington	15
Wilcox	18
Winston	27
Alaska:	
Aleutian Islands	1
Angoon	1
Barrow	1
Bethel	1
Bristol Bay Borough	2
Bristol Bay	1
Cordova-McCarthy	1
Fairbanks	6
Haines	1
Juneau	11
Kenai-Cook Inlet	1
Ketchikan	7
Kobuk	1
Kodiak	2
Kuskokwim	1
Matanuska-Susitna	1
Nome	1
Outer Ketchikan	1
Prince of Wales	1
Seward	1
Sitka	3
Skagway-Yakutat	1
Southeast Fairbanks	1
Upper Yukon	1
Valdez-Chitina-Whittier	1
Wade Hampton	1
Wrangell-Petersburg	1
Yukon-Koyukuk	1
Arizona:	
Apache	3
Cochise	10
Coconino	3
Gila	6
Graham	4
Greenlee	5
Maricopa	22
Mohave	2
Navajo	5
Pima	10
Pinal	13
Santa Cruz	11
Yavapai	5
Yuma	6
Arkansas:	
Arkansas	23
Ashley	27
Baxter	29
Boone	33
Bradley	20
Calhoun	9
Carroll	20
Chicot	28
Clark	25
Clay	29
Cleburne	19
Cleveland	11
Columbia	11
Columbia	34
Conway	30
Crawford	43
Cross	32
Dallas	15
Desha	25
Drew	18
Faulkner	49
Franklin	18
Fulton	13
Grant	15
Greene	43
Hempstead	27
Hot Springs	35
Howard	20
Independence	30
Izard	13
Jackson	33
Jefferson	32
Johnson	20
Lafayette	19
Lawrence	28
Lee	31
Lincoln	23
Little River	23
Logan	23

See footnote at end of table.

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State/County	Population [1]
Lonoke	33
Madison	11
Marion	12
Monroe	26
Montgomery	8
Nevada	16
Newton	7
Ouachita	42
Perry	10
Pike	15
Poinsett	35
Polk	15
Pope	35
Prairie	16
Randolph	20
St. Francis	49
Scott	9
Searcy	12
Sebastian	34
Sevier	22
Sharp	14
Stone	11
Union	43
Van Buren	12
White	38
Woodruff	20
Yell	15
California:	
Alpine	1
Amador	20
Calaveras	13
Colusa	11
Del Norte	14
El Dorado	26
Fresno	42
Glenn	13
Humboldt	28
Imperial	18
Inyo	2
Kern	32
Kings	48
Lake	16
Lassen	4
Madera	19
Mariposa	4
Mendocino	15
Modoc	2
Mono	1
Nevada	27
Plumas	5
Riverside	45
San Benito	13
San Bernardino	26
San Luis Obispo	33
Shasta	20
Sierra	2
Siskiyou	5
Tehama	10
Trinity	2
Tulare	39
Tuolumne	10
Colorado:	
Alamosa	16
Archuleta	2
Baca	2
Bent	4
Chaffee	10
Cheyenne	1
Clear Creek	12
Conejos	6
Costilla	3
Crowley	4
Custer	2
Delta	13
Dolores	2
Douglas	10
Eagle	4
Elbert	2
El Paso	48
Fremont	14
Garfield	5
Gilpin	9
Grand	2
Gunnison	2
Hinsdale	1
Huerfano	4
Jackson	1
Kiowa	1
Kit Carson	3
Lake	22
La Plata	11
Larimer	34
Las Animas	3
Lincoln	2
Logan	10
Mesa	16
Mineral	1
Moffat	1
Montezuma	6
Montrose	8
Morgan	16
Otero	19
Ouray	3
Park	1
Phillips	6
Pitkin	6
Prowers	8
Rio Blanco	1
Rio Grande	11
Routt	3
Saguache	1
San Juan	2
San Miguel	2
Sedgwick	6
Summit	4
Teller	6
Washington	2
Weld	22
Yuma	4
Florida:	
Alachua	45
Baker	16
Calhoun	14
Charlotte	39
Citrus	34
Collier	19
Columbia	32
De Soto	20
Dixie	8
Flagler	9
Franklin	13
Gilchrist	10
Glades	5
Gulf	18
Hamilton	15
Hardee	24
Hendry	10
Hernando	35
Highlands	30
Holmes	22
Jackson	37
Jefferson	15
Lafayette	5
Leon	48
Levy	12
Liberty	4

State/County	Population [1]
Madison	19
Marion	43
Nassau	32
Okeechobee	14
Osceola	19
Putnam	47
Santa Rosa	37
Sumter	27
Suwannee	23
Taylor	13
Union	34
Wakulla	10
Walton	15
Washington	20
Georgia:	
Appling	25
Atkinson	18
Bacon	28
Baker	11
Banks	30
Berrien	25
Bleckley	47
Brantley	13
Brooks	28
Bryan	15
Bullock	46
Burke	22
Calhoun	23
Camden	17
Candler	26
Charlton	7
Clay	18
Clinch	8
Coffee	37
Crawford	18
Dawson	17
Decatur	39
Dodge	31
Dooly	26
Early	24
Echols	5
Effingham	28
Elbert	48
Emanuel	27
Evans	39
Fannin	34
Franklin	49
Gilmer	20
Glascock	16
Grady	38
Greene	25
Hancock	19
Harris	25
Heard	18
Irwin	22
Jasper	15
Jeff Davis	28
Jefferson	32
Jenkins	24
Johnson	25
Jones	30
Lanier	28
Laurens	40
Lee	20
Liberty	34
Lincoln	31
Long	9
Lumpkin	30
McIntosh	17
Macon	32
Madison	48
Marion	14
Meriwether	39
Miller	22
Mitchell	37
Monroe	28
Montgomery	26
Morgan	28
Murray	38
Oconee	43
Oglethorpe	17
Pickens	43
Pierce	27
Pike	32
Pulaski	32
Putnam	25
Quitman	14
Rabun	23
Randolph	20
Schley	19
Screven	19
Seminole	29
Stewart	14
Talbot	17
Taliaferro	12
Tattnall	34
Taylor	20
Telfair	26
Terrell	35
Towns	28
Treutlen	29
Turner	30
Twiggs	23
Union	22
Ware	37
Warren	23
Washington	26
Wayne	28
Webster	12
Wheeler	15
White	32
Wilcox	18
Wilkes	22
Wilkinson	21
Worth	26
Hawaii:	
Hawaii	16
Kauai	48
Maui	39
Idaho:	
Ada	37
Adams	2
Bannock	47
Bear Lake	6
Benewah	8
Bingham	14
Blaine	2
Boise	1
Bonner	9
Bonneville	29
Boundary	4
Butte	1
Camas	1
Caribou	4
Cassia	7
Clark	1
Clearwater	4
Custer	1
Elmore	6
Franklin	11
Fremont	5
Gem	17
Gooding	12
Idaho	2
Jefferson	11
Jerome	17

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State/County	Population [1]
Kootenai	28
Latah	23
Lemhi	1
Lewis	8
Lincoln	3
Madison	28
Minidoka	21
Nez Perce	36
Oneida	2
Owyhee	1
Payette	31
Power	3
Shoshone	8
Teton	5
Twin Falls	21
Valley	1
Washington	5
Illinois:	
Bond	37
Brown	18
Bureau	45
Calhoun	23
Carroll	42
Cass	38
Clark	32
Clay	32
Crawford	45
Cumberland	28
De Witt	43
Douglas	45
Edgar	34
Edwards	32
Fayette	30
Ford	34
Fulton	48
Gallatin	23
Greene	31
Hamilton	20
Hancock	30
Hardin	27
Henderson	22
Iroquois	30
Jasper	22
Jersey	49
Jo Daviess	36
Johnson	22
Lawrence	47
Livingston	39
Marshall	34
Mason	30
Menard	31
Mercer	31
Monroe	49
Montgomery	43
Moultrie	41
Perry	45
Piatt	35
Pike	23
Pope	10
Pulaski	43
Putnam	31
Richland	46
Schuyler	19
Scott	24
Shelby	30
Stark	26
Union	39
Warren	40
Washington	24
Wayne	24
White	34
Indiana:	
Benton	28
Brown	28
Carroll	47
Crawford	26
Fountain	46
Franklin	43
Fulton	46
Greene	49
Harrison	43
Jasper	36
Martin	32
Newton	28
Ohio	49
Orange	42
Owen	31
Parke	33
Pike	37
Pulaski	29
Ripley	48
Spencer	43
Sullivan	44
Switzerland	29
Union	39
Warren	24
Washington	37
White	42
Iowa:	
Adair	17
Adams	15
Allamakee	24
Appanoose	29
Audubon	21
Benton	32
Boone	46
Buchanan	38
Buena Vista	36
Butler	29
Calhoun	25
Carroll	40
Cass	30
Cedar	30
Cherokee	30
Chickasaw	30
Clarke	18
Clay	32
Clayton	26
Crawford	27
Dallas	44
Davis	16
Decatur	18
Delaware	33
Dickinson	33
Dubuque	48
Emmet	36
Effingham	28
Elbert	48
Emanuel	27
Evans	39
Fonnin	34
Franklin	49
Gilmer	20
Glascock	16
Grady	38
Greene	25
Hancock	19
Harris	25
Heard	18
Irwin	22
Jasper	15
Jeff Davis	28
Jefferson	32
Jenkins	24
Johnson	25
Jones	30

State/County	Population [1]
Lanier	28
Laurens	40
Lee	20
Liberty	34
Lincoln	31
Long	9
Lumpkin	30
Fayette	37
Floyd	39
Franklin	23
Fremont	18
Greene	22
Grundy	28
Guthrie	21
Hamilton	32
Hancock	24
Hardin	39
Harrison	23
Henry	41
Howard	24
Humboldt	29
Ida	22
Iowa	26
Jackson	32
Jasper	48
Jefferson	36
Jones	34
Keokuk	24
Kossuth	23
Louisa	27
Lucas	23
Lyon	23
Madison	20
Mahaska	39
Mills	26
Mitchell	26
Monona	17
Monroe	22
Montgomery	30
O'Brien	30
Osceola	21
Page	35
Palo Alto	24
Plymouth	28
Pocahontas	22
Pottawattamie	29
Poweshiek	32
Ringgold	12
Sac	27
Shelby	26
Sioux	37
Tama	28
Taylor	17
Union	32
Van Buren	18
Warren	49
Washington	33
Wayne	16
Winnebago	32
Winneshiek	32
Woodbury	21
Worth	22
Kansas:	
Allen	30
Anderson	15
Atchison	45
Barber	6
Barton	34
Bourbon	24
Brown	20
Butler	27
Chase	4
Chautauqua	7
Cherokee	37
Cheyenne	4
Clark	3
Clay	16
Cloud	19
Coffey	12
Comanche	3
Cowley	31
Decatur	6
Dickinson	23
Doniphan	23
Edwards	7
Elk	6
Ellis	27
Ellsworth	9
Finney	15
Ford	21
Franklin	35
Gove	4
Graham	5
Grant	10
Gray	5
Greeley	2
Greenwood	8
Hamilton	3
Harper	10
Haskell	6
Hodgeman	3
Jackson	16
Jefferson	23
Jewell	7
Kearney	4
Kingman	10
Kiowa	6
Labette	39
Lane	4
Linn	13
Logan	4
Lyon	38
McPherson	28
Marion	15
Marshall	15
Meade	5
Miami	33
Mitchell	11
Morris	9
Morton	5
Nemaha	17
Neosho	32
Ness	8
Norton	8
Osage	19
Osborne	7
Ottawa	9
Pawnee	11
Phillips	9
Pottawatomie	14
Pratt	14
Rawlins	4
Reno	48
Republic	12
Rice	17
Rooks	9
Rush	7
Russell	11
Scott	8
Seward	25
Sheridan	4
Sherman	7
Smith	8
Stafford	7
Stevens	6
Sumner	20

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State/County	Population [1]
Thomas	7
Trego	5
Wabaunsee	8
Wallace	2
Washington	10
Wichita	5
Wilson	20
Woodson	10
Kentucky:	
Adair	35
Allen	36
Anderson	45
Ballard	32
Bath	32
Bracken	35
Breathitt	29
Breckinridge	27
Butler	22
Caldwell	37
Carlisle	27
Casey	30
Clay	39
Clinton	43
Crittenden	23
Cumberland	22
Elliott	29
Estill	25
Fleming	32
Gallatin	41
Garrard	40
Grant	40
Grayson	33
Green	37
Hancock	38
Harrison	46
Hart	33
Henry	38
Hickman	25
Jackson	30
Knott	41
Larue	41
Lee	25
Leslie	31
Letcher	28
Lewis	25
Lincoln	49
Livingston	24
Logan	39
Lyon	26
McCreary	30
McLean	35
Magoffin	34
Marion	49
Martin	41
Menifee	19
Metcalfe	28
Monroe	35
Morgan	27
Nicolas	32
Ohio	32
Owen	21
Owsley	25
Pendleton	36
Powell	45
Robertson	21
Rockcastle	40
Russell	44
Spencer	28
Todel	29
Trigg	21
Trimple	37
Union	47
Washington	35
Wayne	32
Webster	39
Wolfe	25
Louisiana:	
Allen	27
Avoyelles	45
Beauregard	19
Bienville	19
Caldwell	17
Cameron	6
Catahoula	16
Claiborne	22
Concordia	31
De Soto	25
East Carroll	30
East Feliciana	39
Evangeline	48
Franklin	37
Grant	20
Iberville	49
Jackson	27
Jefferson Davis	45
La Salle	21
Madison	23
Morehouse	40
Natchitoches	27
Plaquemines	24
Pointe Coupee	39
Red River	23
Richland	38
Sabine	21
St. Helena	24
St. Martin	44
Tensas	16
Union	21
Vermilion	36
Vernon	40
West Carroll	37
West Feliciana	28
Winn	17
Maine:	
Aroostook	14
Franklin	13
Hancock	23
Lincoln	45
Oxford	21
Penobscot	37
Piscataquis	4
Somerset	10
Waldo	32
Washington	12
Maryland:	
Garrett	33
Queen Annes	49
Michigan:	
Alcona	10
Alger	9
Antrim	26
Arenac	30
Baraga	9
Benzie	27
Charlevoix	40
Cheboygan	23
Chippewa	20
Clare	29
Crawford	12
Delta	31
Dickinson	31
Emmet	40
Gladwin	27
Gogebic	19
Houghton	34
Huron	42

State/County	Population [1]
Iosco	46
Iron	12
Kalkaska	9
Keweenaw	4
Lake	10
Leelanau	32
Luce	7
Mackinac	10
Manistee	37
Marquette	35
Mason	46
Menominee	24
Missaukee	13
Montmorency	9
Newaygo	33
Oceana	34
Ogemaw	21
Ontonagon	8
Osceola	26
Oscoda	8
Otsego	20
Presque Isle	20
Roscommon	19
Sanilac	37
Schoolcraft	7
Weford	35
Minnesota:	
Aitkin	6
Becker	19
Beltrami	11
Big Stone	16
Brown	47
Carlton	33
Cass	9
Chippewa	26
Chisago	42
Clay	45
Clearwater	8
Cook	3
Cottonwood	23
Crow Wing	35
Dodge	30
Douglas	35
Faribault	29
Fillmore	26
Goodhue	46
Grant	14
Houston	31
Hubbard	11
Isanti	38
Itasca	13
Jackson	21
Kanabec	19
Kandiyohi	39
Kittson	6
Koochiching	5
Lac Qui Parle	15
Lake	6
Lake of the Woods	3
Le Sueur	48
Lincoln	15
Lyon	34
Mahnomen	10
Marshall	7
Martin	35
Meeker	30
Mille Lacs	28
Morrison	24
Murray	18
Nobles	33
Norman	11
Otter Tail	23
Pennington	21
Pine	12
Pipestone	28
Polk	17
Pope	17
Red Lake	12
Redwood	23
Renville	22
Rock	23
Roseau	7
St. Louis	36
Sherburne	43
Sibley	27
Stevens	20
Swift	18
Todd	23
Traverse	11
Wabasha	33
Wadena	23
Waseca	40
Watonwan	31
Wilkin	12
Yellow Medicine	19
Mississippi:	
Amite	19
Attala	27
Benton	18
Calhoun	25
Carroll	15
Chickasaw	33
Choctaw	20
Claiborne	21
Clarke	22
Clay	46
Copiah	32
Covington	34
Franklin	14
George	26
Greene	12
Grenada	46
Hancock	36
Holmes	30
Humphreys	35
Issaquena	7
Itawamba	31
Jasper	23
Jefferson	18
Jefferson Davis	31
Kemper	14
Lafayette	36
Lamar	30
Lawrence	26
Leake	29
Lincoln	45
Madison	41
Marion	42
Marshall	34
Monroe	44
Montgomery	32
Neshoba	37
Newton	33
Noxubee	21
Panola	39
Pearl River	34
Perry	14
Pontotoc	35
Prentiss	48
Quitman	39
Scott	35
Sharkey	20
Simpson	34
Smith	21
Stone	18
Tallahatchie	30

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State/County	Population [1]
Tate	46
Tippah	34
Tishomingo	34
Tunica	26
Union	45
Walthall	31
Wayne	20
Webster	24
Wilkinson	16
Winston	30
Yalobusha	24
Yazoo	29
Missouri:	
Adair	39
Andrew	27
Atchison	17
Audrain	37
Barry	25
Barton	18
Bates	18
Benton	13
Bollinger	14
Butler	47
Caldwell	19
Callaway	31
Camden	21
Carroll	18
Carter	8
Cedar	19
Chariton	15
Christian	27
Clark	16
Clinton	30
Cooper	26
Crawford	20
Dade	14
Dallas	19
Daviess	15
Dekalb	17
Dent	15
Douglas	11
Gasconade	23
Gentry	17
Grundy	27
Harrison	14
Henry	25
Hickory	12
Holt	15
Howard	22
Howell	26
Iron	17
Johnson	41
Knox	11
Laclede	26
Lafayette	42
Lawrence	40
Lewis	22
Lincoln	29
Linn	24
Livingston	29
McDonald	23
Macon	19
Madison	17
Maries	13
Mercer	11
Miller	25
Mississippi	40
Moniteau	26
Monroe	14
Montgomery	21
Morgan	17
New Madrid	34
Nodaway	26
Oregon	12
Osage	18
Ozark	9
Perry	31
Phelps	44
Pike	25
Polk	24
Putnam	11
Ralls	16
Randolph	47
Ray	31
Reynolds	7
Ripley	15
St. Clair	11
Ste. Genevieve	26
Saline	33
Schuyler	15
Scotland	12
Shannon	7
Shelby	16
Stoddard	31
Stone	22
Sullivan	12
Taney	21
Texas	15
Vernon	23
Warren	23
Washington	20
Wayne	11
Webster	26
Worth	13
Wright	20
Montana:	
Beaverhead	1
Big Horn	2
Blaine	2
Broadwater	2
Carbon	3
Carter	1
Cascade	8
Chouteau	2
Custer	3
Daniels	2
Dawson	5
Deer Lodge	21
Fallon	2
Fergus	3
Flathead	8
Gallatin	13
Garfield	0
Glacier	4
Golden Valley	1
Granite	2
Hill	6
Jefferson	3
Judith Basin	1
Lake	10
Lewis and Clark	10
Liberty	2
Lincoln	5
McCone	1
Madison	1
Meagher	1
Mineral	2
Missoula	22
Musselshell	2
Park	4
Petroleum	0
Philips	1
Pondera	4
Powder River	1
Powell	3
Prairie	1

State/County	Population [1]
Ravalli	6
Richland	5
Roosevelt	4
Rosebud	1
Sanders	3
Sheridan	3
Stillwater	3
Sweet Grass	2
Teton	3
Toole	3
Treasure	1
Valley	2
Wheatland	2
Wibaux	2
Yellowstone	10
Nebraska:	
Antelope	11
Arthur	1
Banner	1
Blaine	1
Boone	12
Box Butte	9
Boyd	7
Brown	3
Buffalo	33
Burt	19
Butler	16
Cass	33
Cedar	16
Chase	5
Cherry	1
Cheyenne	9
Clay	15
Colfax	23
Cuming	21
Custer	6
Dawes	7
Dawson	20
Deuel	6
Dixon	16
Dundy	3
Fillmore	14
Franklin	8
Frontier	4
Furnas	10
Gage	30
Garden	2
Garfield	4
Gosper	5
Grant	1
Greeley	7
Hamilton	7
Harlan	8
Hayes	2
Hitchcock	6
Holt	5
Hooker	1
Howard	12
Jefferson	18
Johnson	15
Kearney	13
Keith	8
Keya Paha	2
Kimball	6
Knox	11
Lancaster	23
Lincoln	12
Logan	2
Loup	1
McPherson	1
Madison	48
Merrick	18
Morrill	4
Nance	12
Nemaha	22
Nuckolls	13
Otoe	25
Pawnee	10
Perkins	4
Phelps	18
Pierce	15
Platte	40
Polk	15
Red Willow	18
Richardson	22
Rock	2
Saline	22
Saunders	22
Seward	25
Sheridan	3
Sherman	8
Sioux	1
Stanton	13
Thayer	13
Thomas	1
Thurston	18
Valley	10
Washington	34
Wayne	23
Webster	9
Wheeler	2
York	24
Nevada:	
Churchill	2
Clark	19
Douglas	10
Elko	1
Esmeralda	0
Eureka	0
Humboldt	1
Lander	0
Lincoln	0
Lyon	4
Mineral	2
Nye	0
Pershing	0
Storey	3
Washoe	8
White Pine	1
New Hampshire:	
Carroll	20
Coos	19
Grafton	32
New Mexico:	
Catron	0
Chaves	7
Colfax	3
Curry	28
De Baca	1
Dona Ana	18
Eddy	10
Grant	6
Guadalupe	2
Harding	1
Hidalgo	1
Lea	11
Lincoln	2
Luna	4
McKinley	8
Mora	2
Otero	6
Quay	4
Rio Arriba	4
Roosevelt	7
Sandoval	5
San Juan	10

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State/County	Population [1]
San Miguel	5
Santa Fe	29
Sierra	2
Socorro	1
Taos	8
Torrance	2
Union	1
Valencia	7
New York:	
Allegany	44
Delaware	31
Essex	19
Franklin	26
Hamilton	3
Herkimer	47
Lewis	18
St. Lawrence	41
Schoharie	40
North Carolina:	
Alleghany	36
Anson	46
Beaufort	44
Bertie	29
Bladen	30
Brunswick	28
Camden	23
Caswell	45
Chatham	42
Cherokee	36
Clay	25
Currituck	28
Dare	18
Duplin	47
Gates	25
Graham	22
Greene	26
Hoke	42
Hyde	9
Jackson	44
Jones	21
Macon	31
Madison	36
Montgomery	39
Northampton	45
Pamlico	28
Pender	21
Perquimans	34
Polk	49
Sampson	48
Swain	17
Tyrell	10
Warren	37
Washington	41
Yancey	40
North Dakota:	
Adams	4
Barnes	10
Benson	6
Billings	1
Bottineau	6
Bowman	3
Burke	4
Burleigh	25
Cass	12
Cavalier	5
Dickey	6
Divide	4
Dunn	2
Eddy	6
Emmons	5
Foster	7
Golden Valley	3
Grand Forks	42
Grant	3
Griggs	6
Hettinger	4
Kidder	3
Lamoure	6
Logan	4
McHenry	5
McIntosh	6
McKenzie	2
McLean	5
Mercer	6
Morton	11
Mountrail	5
Nelson	6
Oliver	3
Pembina	10
Pierce	6
Ramsey	10
Ransom	8
Renville	4
Richland	12
Rolette	13
Sargent	7
Sheridan	3
Sioux	3
Slope	1
Stark	15
Steele	5
Stutsman	10
Towner	4
Traill	11
Walsh	13
Ward	29
Wells	6
Williams	9
Ohio:	
Adams	32
Harrison	42
Hocking	48
Meigs	45
Monroe	35
Morgan	29
Noble	26
Paulding	46
Pike	43
Vinton	23
Oklahoma:	
Adair	27
Alfalfa	8
Atoka	11
Beaver	4
Beckham	17
Blaine	13
Bryan	29
Caddo	23
Canadian	36
Carter	45
Cherokee	31
Choctaw	19
Cimarron	2
Coal	11
Comanche	32
Cotton	10
Craig	19
Creek	49
Custer	23
Delaware	25
Dewey	6
Ellis	4
Garvin	31
Grady	27
Grant	7
Greer	13

State/County	Population [1]
Harman	9
Harper	5
Haskell	16
Hughes	16
Jackson	38
Jefferson	9
Johnston	12
Kingfisher	14
Kiowa	12
Latimer	12
Le Flore	21
Lincoln	20
Logan	26
Coal	11
Comanche	32
Cotton	10
Craig	19
Creek	49
Custer	23
Delaware	25
Dewey	6
Ellis	4
Garvin	31
Grady	27
Grant	7
Greer	13
Harman	9
Harper	5
Haskell	16
Hughes	16
Jackson	38
Jefferson	9
Johnston	12
Kingfisher	14
Kiowa	12
Latimer	12
Le Flore	21
Lincoln	20
Logan	26
Love	11
McClain	25
McCurtain	16
McIntosh	21
Major	8
Marshall	21
Maves	36
Murray	25
Noble	14
Nowata	18
Okfuskee	17
Osage	13
Pawnee	20
Pittsburg	30
Pontotoc	39
Pushmataha	7
Roger Mills	4
Rogers	41
Seminole	40
Sequoyah	34
Stephens	40
Texas	8
Tillman	14
Wagoner	39
Washita	12
Woods	9
Woodward	12
Oregon:	
Baker	5
Clatsop	35
Columbia	45
Coos	35
Crook	3
Curry	8
Deschutes	10
Douglas	14
Gilliam	2
Grant	2
Harney	1
Hood River	25
Jackson	34
Jefferson	5
Josephine	22
Klamath	8
Lake	1
Lane	30
Lincoln	26
Linn	31
Malheur	2
Morrow	2
Polk	48
Sherman	3
Tillamook	16
Umatilla	14
Union	10
Wallowa	2
Warsco	8
Wheeler	1
Pennsylvania:	
Bedford	42
Cameron	18
Clinton	42
Elk	47
Forest	12
Huntingdon	44
Juniata	43
Pike	22
Potter	15
Sullivan	12
Susquehanna	41
Tioga	35
Wayne	40
Wyoming	48
South Carolina:	
Abbeville	42
Allendale	23
Bamberg	40
Barnwell	31
Calhoun	30
Chesterfield	43
Clarendon	43
Colleton	26
Edgefield	33
Fairfield	29
Georgetown	41
Hampton	26
Jasper	18
Kershaw	44
Lee	45
McCormick	22
Newberry	46
Saluda	32
Williamsburg	37
South Dakota:	
Aurora	6
Beadle	3
Bennett	15
Bon Homme	15
Brookings	28
Brown	22
Brule	7
Buffalo	4
Butte	3
Campbell	4
Charles Mix	9
Clark	6
Clay	32

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State/County	Population [1]
Codington	28
Corson	2
Custer	3
Davison	40
Day	8
Deuel	9
Dewey	2
Douglas	11
Edmunds	5
Fall River	4
Faulk	4
Grant	13
Gregory	7
Haakon	2
Hamlin	11
Hand	4
Hanson	9
Harding	1
Hughes	16
Hutchinson	13
Hyde	3
Jackson	2
Jerauld	6
Jones	2
Kingsbury	9
Lake	20
Lawrence	22
Lincoln	20
Lyman	2
McCook	13
McPherson	4
Marshall	7
Meade	5
Mellette	2
Miner	8
Minnehaha	29
Moody	15
Pennington	21
Perkins	2
Potter	5
Roberts	11
Sanborn	6
Shannon	4
Spink	7
Stanley	2
Sully	2
Todd	5
Tripp	5
Turner	16
Union	21
Walworth	11
Washabaugh	1
Yankton	37
Ziebach	1
Tennessee:	
Benton	31
Bledsoe	19
Cannon	31
Carroll	43
Cheatham	43
Chester	35
Claiborne	44
Clay	28
Cumberland	31
Decatur	28
DeKalb	40
Dickson	45
Fayette	32
Fentress	25
Franklin	49
Giles	36
Grainger	49
Grundy	30
Hancock	29
Hardeman	34
Hardin	31
Haywood	38
Henderson	34
Henry	42
Hickman	20
Houston	29
Humphreys	26
Jackson	25
Johnson	39
Lake	48
Lauderdale	42
Lawrence	46
Lewis	24
Lincoln	42
McNairy	32
Macon	41
Marion	41
Marshall	46
Meigs	27
Monroe	36
Moore	29
Morgan	25
Overton	34
Perry	13
Pickett	24
Polk	27
Scott	27
Sequatchie	23
Sevier	47
Smith	39
Stewart	16
Trousdale	45
Union	43
Van Buren	15
Wayne	17
White	43
Texas:	
Anderson	26
Andrews	7
Aransas	32
Archer	6
Armstrong	2
Atascosa	16
Austin	21
Bailey	10
Bandera	6
Bastrop	19
Baylor	6
Bee	27
Blanco	5
Borden	1
Bosque	11
Brewster	1
Briscoe	3
Brooks	9
Brown	28
Burleson	15
Burnet	11
Caldwell	39
Calhoun	34
Callahan	10
Camp	42
Carson	7
Cass	26
Castro	12
Chambers	20
Cherokee	31
Childress	9
Clay	7
Cochran	7
Coke	8

State/County	Population [1]
Coleman	8
Collingsworth	5
Colorado	19
Comal	43
Comanche	13
Concho	3
Cooke	26
Coryell	34
Cottle	4
Crane	5
Crockett	1
Crosby	10
Culberson	1
Dallam	4
Dawson	18
Deaf Smith	13
Delta	18
De Witt	21
Dickens	4
Dimmit	7
Donley	4
Duval	6
Eastland	19
Ector	15
Edwards	1
El Paso	39
Erath	17
Falls	23
Fannin	25
Fayette	19
Fisher	7
Floyd	11
Foard	3
Franklin	18
Freestone	13
Frio	10
Gaines	8
Garza	6
Gillespie	10
Glasscock	1
Gonzales	16
Gray	29
Grimes	15
Guadalupe	47
Hale	35
Hall	7
Hamilton	9
Hansford	7
Hardeman	10
Hardin	33
Hartley	2
Haskell	10
Hays	43
Hamphill	3
Henderson	28
Hill	22
Hockley	22
Hood	15
Hopkins	26
Houston	14
Howard	41
Hudspeth	1
Hutchinson	28
Iron	1
Jack	7
Jackson	15
Jasper	27
Jeff Davis	1
Jim Hogg	4
Jim Wells	39
Jones	17
Karnes	18
Kaufman	40

State/County	Population [1]
Kendall	10
Kenedy	0
Kent	2
Kerr	18
Kimble	3
King	0
Kinney	1
Kleberg	39
Knox	7
Lamar	40
Lamb	17
Lampasas	13
La Salle	3
Lavaca	18
Lee	13
Leon	8
Liberty	28
Limestone	19
Lipscomp	4
Live Oak	6
Llano	7
Loving	0
Lubbock	37
Lynn	10
McCulloch	8
McMullen	1
Madison	16
Marion	22
Martin	5
Mason	4
Matagorda	24
Maverick	14
Medina	15
Menard	3
Midland	6
Milam	19
Mills	6
Mitchell	10
Montague	16
Montgomery	45
Moore	15
Morris	47
Motley	2
Nacogdoches	40
Navarro	29
Newton	12
Nolan	18
Nueces	44
Ochiltree	11
Oldham	2
Palo Pinto	31
Panola	18
Parker	38
Parmer	12
Pecos	3
Polk	13
Potter	50
Presidio	1
Rains	18
Randall	50
Reagan	3
Real	3
Red River	14
Reeves	6
Refugio	12
Roberts	1
Robertson	16
Rockwall	48
Runnels	11
Rusk	36
Sabine	16
San Augustine	17
San Jacinto	11

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State/County	Population [1]
San Saba	5
Schleicher	2
Scurry	17
Shackelford	4
Shelby	25
Sherman	4
Smith	43
Somervell	14
Starr	15
Stephens	9
Sterling	1
Stonewall	3
Sutton	2
Swisher	12
Taylor	10
Terrell	1
Terry	16
Throckmorton	2
Titus	40
Tom Green	5
Travis	46
Trinity	11
Tyler	14
Upshur	36
Upton	4
Uvalde	11
Val Verde	8
Van Zandt	26
Walker	35
Waller	28
Ward	16
Washington	32
Webb	1
Wharton	34
Wheeler	7
Wichita	43
Wilbarger	16
Willacy	26
Williamson	34
Wilson	16
Winkler	11
Wise	21
Wood	26
Yoakum	9
Young	17
Zapata	5
Zavala	9
Utah:	
Beaver	1
Box Elder	5
Cache	36
Carbon	11
Daggett	1
Duchesne	2
Emery	1
Garfield	1
Grand	2
Iron	4
Juab	1
Kane	1
Millard	1
Morgan	7
Piute	2
Rich	2
San Juan	1
Sanpete	7
Sevier	5
Summit	3
Tooele	3
Unitah	3
Utah	42
Wasatch	5
Washington	6
Wayne	1
Vermont:	
Addison	31
Bennington	44
Caledonia	37
Essex	8
Franklin	47
Grand Isle	43
Lamoille	28
Orange	26
Orleans	28
Windham	43
Windsor	46
Virginia:	
Alleghany	28
Amelia	21
Appomattox	28
Augusta	45
Bath	10
Bedford	37
Bland	15
Botetourt	33
Brunswick	28
Buckingham	18
Caroline	26
Carroll	47
Charles City	34
Charlotte	26
Clarke	47
Craig	10
Culpeper	47
Cumberland	21
Dickenson	48
Dinwiddie	49
Essex	28
Fauquier	40
Floyd	26
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New Kent	25
Northumberland	49
Nottoway	46
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Patrick	33
Powhatan	29
Prince Edward	40
Rappahannock	19
Richmond	34
Rockbridge	28
Scott	45
Shenandoah	45
Southampton	31
Spotsylvania	40
Surry	21
Sussex	23
Wythe	48

State/County	Population [1]
Washington:	
Adams	6
Asotin	22
Benton	39
Chelan	14
Clallam	20
Columbia	5
Douglas	9
Ferry	2
Franklin	21
Garfield	4
Grant	16
Grays Harbor	31
Jefferson	6
Kittitas	11
Klickitat	6
Lewis	19
Lincoln	4
Mason	22
Okanogan	5
Pacific	17
Pend Oreille	4
San Juan	22
Skagit	30
Skamania	3
Stevens	7
Wahkiakum	14
Walla Walla	33
Whatcom	39
Whitman	18
Yakima	34
West Virginia:	
Barbour	41
Braxton	25
Calhoun	25
Clay	27
Doddridge	20
Gilmer	23
Grant	18
Greenbrier	31
Hampshire	18
Hardy	15
Jackson	45
Lewis	46
Lincoln	43
Monroe	24
Morgan	37
Nicholas	35
Pendleton	10
Pocahontas	9
Preston	39
Randolph	24
Ritchie	22
Roane	29
Summers	38
Tucker	18
Tyler	39
Webster	18
Wirt	16
Wisconsin:	
Adams	14
Ashland	16
Barron	39
Bayfield	8
Buffalo	19
Burnett	11
Chippewa	47
Clark	25
Crawford	27
Door	41
Douglas	34
Dunn	34
Florence	7
Forest	8
Grant	42
Jackson	5
Juneau	24
Lafayette	22
Langlade	22
Green	46
Green Lake	48
Iowa	25
Iron	9
Lincoln	26
Marinette	26
Marquette	19
Menominee	7
Monroe	35
Oconto	26
Oneida	22
Pepin	31
Pierce	45
Polk	29
Pierce	12
Richland	29
Rock	16
St. Croix	47
Sauk	46
Sawyer	8
Shawano	36
Taylor	17
Trempealeau	32
Vernon	31
Vilas	13
Washburn	13
Waushara	24
Wyoming:	
Albany	6
Big Horn	3
Campbell	3
Carbon	2
Converse	1
Crook	2
Fremont	3
Goshen	5
Hot Springs	2
Johnson	1
Laramie	21
Lincoln	2
Natrona	10
Niobrara	1
Park	3
Platte	3
Sheridan	7
Sublette	1
Sweetwater	2
Teton	1
Uinta	3
Washakie	3
Weston	3

[1] County density (persons per square mile) excluding cities of 50,000 or more.

[39 FR 43285, Dec. 12, 1974, as amended at 40 FR 38156, Aug. 27, 1975]

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FINDING AIDS

A list of CFR titles, subtitles, chapters, subchapters and parts and an alphabetical list of agencies publishing in the CFR are included in the CFR Index and Finding Aids volume to the Code of Federal Regulations which is published separately and revised annually.

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53.2 Revised ..... Δ 11255
53.7 (b) and (c) added ..... Δ 11256
53.9 (d) through (g) added ..... Δ 11256
53.14 (a) amended ..... Δ 11256
53.16 Added ..... Δ 11256
55.01 (b)(1) revised; (b)(2) removed; (b)(3) through (b)(5) redesignated as (b)(2) through (b)(4) 58645

NOTE: Symbol (†) refers to 1975 page numbers.
NOTE: Symbol (Δ) refers to 1976 pages.

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55.02 (j) added 58645
55.04 (a)(1)(i) and (2)(i)(C), (e) and (n) amended; (g) (added) 58645
60 Authority citation revised 53346
Technical correction 59204
60.1 Revised 53346
60.2 (r) revised; (x), (y), and (z) added 46254
(d) and (h) revised; (aa) and (bb) added 58418
60.4 (b)(F) revised 42194, 45170
(b)(HH) added 48347
(b)(G) added 50719
(b)(U) added 59729
(b)(X) added Δ1914
(b)(WW) revised Δ4264
(b)(MM) added Δ7749
(b)(VV) added Δ8346
(b)(H) added Δ11820
(b)(QQ) added Δ17549
(b)(W) added Δ19633
(b)(EE) added Δ19633
(b)(F) revised Δ21450
(b)(TT) added Δ24124
(b)(L) added Δ24885
60.5 Revised 58418
60.7 (a)(5) added; (b), (c), and (d) revised 46254
(a) (1) and (2) revised; (a)(3), (a)(4), and (e) added 58418
60.13 Added 46255
(c)(2)(iii) corrected; (h)(1) and (h)(1) (i) through (ix) correctly designated as (i) and (i)(1) through (9) 59205
60.14 Added 58419
60.15 Added 58420
60.20—60.29 (Subpart B) Added 53346
60.42 (a)(2) amended 46256
60.45 Revised 46256
(f)(5) corrected 59205
60.46 Revised 46258
60.62 (d) removed 46258
60.72 (a)(2) amended 46258
60.73 (a), (b), (c), and (e) revised 46258
60.83 (a)(2) amended 46258
60.84 (a), (b), (c), and (e) revised 46258
60.92 (a)(2) amended 46259
60.102 (a)(2) amended 46259
60.105 (a), (b), and (e) revised 46259
60.122 (c) removed 46259
60.132 (c) removed 46259

NOTE: Symbol (Δ) refers to 1976 page numbers.

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60.152 (a)(2) amended 46259
60.160—60.166 (Subpart P) Added Δ2338
60.165 (a) corrected Δ8346
60.170—60.176 (Subpart Q) Added Δ2340
60.180—60.186 (Subpart R) Added Δ2340
60.190—60.195 (Subpart S) Added Δ3828
60.200—60.244 (Subpart T) Added 33154
60.210—60.214 (Subpart U) Added 33155
60.220—60.224 (Subpart V) Added 33155
60.230—60.234 (Subpart W) Added 33156
60.240—60.244 (Subpart X) Added 33156
60.250—60.254 (Subpart Y) Added Δ2234
60.260—60.266 (Subpart Z) Added Δ18501
Heading corrected Δ20659
60.260 Corrected Δ20659
60.261 (i) corrected Δ20659
60.266 (h) corrected Δ20659
60.270—60.275 (Subpart AA) Added 43853
60 Appendix A amended 33157
Appendix B added 46259
Appendix D added 53349
Appendix B corrected 59204, 59205
Appendix C added 58420
Appendix A amended Δ3828
61 Authority citation revised 48299
61.04 (b) (F) revised 42195, 45171
(b)(HH) added 48348
(b)(G) added 50719
(b)(WW) revised 58646
(b)(U) added 59729
(b)(X) added Δ1914
(b)(WW) amended Δ4264
(b)(MM) added Δ7750
(b)(VV) revised Δ8346
(b)(H) revised Δ11820
(b)(W) added Δ19633
(b)(EE) added Δ19633
(b)(L) added Δ24885
61.14 (c) revised; (d) added 48299
61.17 Added 48299
61.21 (j) revised; (k) through (w) added 48299

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61.22 (c) and (e) amended; (b), (d), (f), and (g) revised; (h) through (l) added 48299
61.23 Amended 48302
61.24 (c) revised and redesignated as (e); new (c) and (d) added ... 48302
61.25 Added 48302
61.50 Revised 48302
61.51 (l) and (m) added 48302
61.52 Revised 48302
61.53 (d) added 48302
61.54 Added 48303
61.55 Added 48303
61 Appendix A revised 48303
Appendix B amended 48311
79 Revised 52011
79.4 (b)(4) revised Δ21324
79.12 Revised Δ21324
79.13 (a) revised Δ21324
79.20 Amended Δ21324
79.21 (a)(2) revised Δ21324
79.22 Revised Δ21324
79.23 (a) revised Δ21324
79.31 (a) amended; (b) revised Δ21324
79.32 (b) revised Δ21324
80.7 Added 36336
80.21 Text designated as (a); (b) added 29292
80.301—80.332 (Subpart D) Added 39965
80.330 (d) added Δ10065
80 Appendix C heading amended 38156

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53.20 Table B-1 revised 52694
53.23(d)(2) Table B-3 revised 52694
53.32(g) Table C-1 revised 52695
55.570 (Subpart L) Added 55194
55.820 (Subpart Q) Added 39316
55.821 Added 39317
55.870 (Subpart R) Added 39318
55.871 Added 39317
55.872 Added 43904
55.1320 (Subpart AA) Added 39319
55.1321 Added 39319
55.1520 (Subpart EE) Added 36813
55.1770 (Subpart II) Added 55195

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60.4 (b)(F) revised ... 27967, 33264, 48342, 54757
(b)(CCC) added 34629
(b)(CCC) revised 34629
(b)(B) added 40467
(b)(P) added 43148
(b)(JJ) added 44859
(b)(D) added 53017
(b)(KK) added 55531
(b)(II) added 56805
(b)(Q) and (CC) added 56806
(b)(UU) added *1214
(b)(PP) added *4214
(b)(NN)(a) added *6812
(a) corrected *16777
(b)(YY) added *16778
60.9 Revised 36918
60.11 (b) revised *26206
60.13 (i) introductory text revised 35185
(c)(3) and (e)(1) revised *5936
60.40 Revised 51398
60.41 (d) and (e) added 51398
60.42 (a)(1) revised 51398
60.43 (a) (1) and (2) and (b) revised 51398
60.44 (a) (1) to (3) and (b) revised 51398
60.45 (e) and (f) (1), a2), (4)(i) to (iv), (5) introductory text, (5)(ii) and (6) revised; (f) (4)(v) and (5)(iii) added 51399
(a), (b), (c), and (e) revised; (d) removed *5936
60.46 (b), (f) (1), (2) and introductory text of (3) and (g) revised 51399
60.102 (a)(2) revised *32427
60.105 (e)(1) added *32427
60.106 (e) added *32427
60 Appendix A amended 52299
Appendix B amended *5937
61 Authority citation revised 46564
Technical correction 53017
61.04 (b)(F) revised ... 27967, 33264, 40108, 48343, 54758
(b)(CCC) added 34629
(b)(B) added 40468
(b)(P) added 43149
(b)(JJ) added 44860
(b)(D) added 53017
(b)(II) added 56805
(b)(UU) added *1215
(b)(PP) added *4124

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(b)(NN)(b) added *6812
(b)(NN)(a) added *6813
(a) corrected; (b)(YY) added *16778
61.15 Revised 36918
61.21 (x) added *12127
61.60—61.71 (Subpart F) Added 46564
61.60 (c) amended *29006
61.61 (t) and (u) added *29006
61.62 Revised *29006
61.65 (b)(9)(i) and (c) corrected 53017
(b)(1) and (b)(8)(iii)(A) and (B) revised *29006
61.67 (d) removed; (e), (g)(1) (ii) and (iii) revised; (g)(1) (iv) added *29007
61.68 (a) and (c) corrected 53017
(c)(1) and (2) revised *29007
61.70 (a) corrected 53018
(c)(2)(i) and (v) revised *29007
61.71 (a) (2) and (3) revised; (a) (4) added *29007
61 Appendix B amended ... 46569, 53018, *29007
79.3 Revised 36918
80.1 Existing text designated as (a); (b) added *25732
80.20 (a)(1) (i), (ii) and (iii) removed; (a)(1) (iv) and (v) redesignated as (a)(1) (i) and (ii) and revised; (a)(4) added ... 42677
(a)(4) determination 55646
(a)(4) (ii) and (iv) amended; (b) removed 55345
(a)(4) (ii) and (v) effective date suspended in part to 3-31-77 ... *1037

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55.570 (a)(1) (iii), (iv), (vi), and (vii) revised 56608
55.872 (a) introductory text and (1) revised ..... †14471
55.1520 Removed 41282
1—610 (Chapter I) Appendix A added 60912
60 Authority citation revised 41424
Authority citation revised ..... †8800
60.2 (1) revised ..... †9278

NOTE: Symbol (*) refers to 1977 page numbers.
NOTE: Symbol (†) refers to 1978 page numbers.

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60.3 Revised 37000
(a) corrected 38178
60.4 (b)(FF) revised 37387
(b)(BB) revised 44545
(b)(ZZ) added 46304
(b)(BBB) revised 62137
(b)(Y) added; eff. 10-6-77 ..... †10
(b)(S) added ..... †3361
(b)(I) revised ..... †6771
(b) (D), (F), and (DD) revised ... †20987
60.7 Authority citation added 41424
Authority citation revised ..... †8800
60.8 Authority citation added 41424
(c) revised 57126
Authority citation revised ..... †8800
60.9 Authority citation added 41424
Authority citation revised ..... †8800
60.10 Authority citation added ... 41424
Authority citation revised ..... †8800
60.11 Authority citation added ... 41424
Authority citation revised ..... †8800
60.13 Authority citation added ... 41424
(a) revised ..... †7572
Authority citation revised ..... †8800
60.24 (g) authority citation added 41424
Authority citation revised ..... †8800
60.30—60.34 (Subpart C) added ... 55797
60.40 Revised 37936
(c) revised; (d) added ..... †9278
60.41 (f) added ..... †9278
60.42 (a)(2) revised 61537
60.44 (a)(4) and (5), (c) and (d) added; (b) revised ..... †9278
60.45 (f)(4) (iii) and (iv) and (5) corrected; (f)(4)(v) revised 41122
Authority citation added 41424
(g)(1) added 61537
Authority citation revised ..... †8800
(f)(4)(vi) added ..... †9278
60.46 Authority citation added ... 41424
Authority citation revised ..... †8800
60.50 Revised 37936
60.53 Authority citation added ... 41424
Authority citation revised ..... †8800
60.54 Authority citation added ... 41424
Authority citation revised ..... †8800
60.60 Revised 37936
60.63 Authority citation added ... 41424
Authority citation revised ..... †8800
60.64 Authority citation added ... 41424
Authority citation revised ..... †8800
60.70 Revised 37936
60.73 Authority citation added ... 41424
Authority citation revised ..... †8800

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60.74 Authority citation added...41424
Authority citation revised.....†8800
60.80 Revised.....37936
60.84 Authority citation added...41424
Authority citation revised.....†8800
60.85 Authority citation added...41424
Authority citation revised.....†8800
60.90 Revised.....37936
60.93 Authority citation added...41424
Authority citation revised.....†8800
60.100 Revised.....37937
Revised.....†10868
60.101 (i) through (m) added.....†10868
60.102 (a)(2) effective date corrected to 6-24-77.....38178
(a)(2) corrected.....39389
(a) introductory text and (b) revised.....†10868
60.104 Revised.....†10869
60.105 (e)(1) effective date corrected to 6-24-77.....38178
(e)(1) corrected.....39389
Authority citation added.....41424
Authority citation revised.....†8800
(a)(2) and (4) through (6) and (e)(2) and (3) added.....†10869
60.106 (e) effective date corrected to 6-24-77.....38178
Authority citation added.....41424
Authority citation revised.....†8800
(c) and (d) revised.....†10869
60.110 Revised.....37937
60.113 Authority citation added.....41424
Authority citation revised.....†8800
60.120 Revised.....37937
60.123 Authority citation added.....41424
Authority citation revised.....†8800
60.130 Revised.....37937
60.133 Authority citation added.....41424
Authority citation revised.....†8800
60.140 Revised.....37937
60.141 (c) added.....†15602
60.142 (a)(2) added.....†15602
60.143 added.....†15602
60.144 Authority citation added.....41424
Authority citation revised.....†8800
(a)(5) and (c) added.....†15602
60.150 Revised.....37937,58521
60.153 Authority citation added.....41424

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Revised.....58521
Authority citation revised.....†8800
60.154 Authority citation added.....41424
Authority citation revised.....†8800
60.160 Revised.....37937
60.165 Authority citation added.....41424
(d)(2) revised.....57126
Authority citation revised.....†8800
60.166 Authority citation added.....41424
Authority citation revised.....†8800
60.170 Revised.....37937
60.175 Authority citation added.....41424
Authority citation revised.....†8800
60.176 Authority citation added.....41424
Authority citation revised.....†8800
60.180 Revised.....37937
60.185 Authority citation added.....41424
Authority citation revised.....†8800
60.186 Authority citation added.....41424
Authority citation revised.....†8800
60.190 Revised.....37937
60.194 Authority citation added.....41424
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60.195 Authority citation added.....41424
Authority citation revised.....†8800
60.200 Revised.....37937
60.203 Authority citation added.....41424
Authority citation revised.....†8800
60.204 Authority citation added.....41424
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60.210 Revised.....37937
60.213 Authority citated added.....41424
Authority citation revised.....†8800
60.214 Authority citation added.....41424
Authority citation revised.....†8800
60.220 Revised.....37938
60.223 Authority citation added.....41424
Authority citation revised.....†8800
60.224 Authority citation added.....41424
Authority citation revised.....†8800

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60.230 Revised 37938
60.233 Authority citation added 41424
Authority citation revised ..... † 8800
60.234 Authority citation added 41424
Authority citation revised ..... † 8800
60.240 Revised 37938
60.243 Authority citation added 41424
Authority citation revised ..... † 8800
60.244 Authority citation added 41424
Authority citation revised ..... † 8800
60.250 Revised 37938
(b) corrected 44812
60.253 Authority citation added 41424
Authority citation revised ..... † 8800
60.254 Authority citation added 41424
Authority citation revised ..... † 8800
60.260 Revised 37938
60.264 Authority citation added 41424
Authority citation revised ..... † 8800
60.265 Authority citation added 41424
Authority citation revised ..... † 8800
60.266 Authority citation added 41424
Authority citation revised ..... † 8800
60.270 Revised 37938
(b) corrected 44812
60.273 Authority citation added 41424
Authority citation revised ..... † 8800
60.274 Authority citation added 41424
Authority citation revised ..... † 8800
60.275 Authority citation added 41424
Authority citation revised ..... † 8800
60.280—60.285 (Subpart BB) Added ..... † 7572
60.340—60.344 (Subpart HH) Added ..... † 9453
60 Appendixes A through D authority citations added 41424
Appendix A amended 41755
Appendix A amended ..... † 1495
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61 Authority citation revised 41424
Authority citation revised ..... † 8800
61.03 Revised 51574
61.04 (b)(FF) revised 37387
(b)(BB) revised 44545
(b)(BBB) revised 62137
(b)(Y) added; eff. 10-6-77 ..... † 10
(b)(S) added ..... † 3361
(b)(I) revised ..... † 6771
(b)(D), (F), and (DD) revised ..... † 20988
61.09 Authority citation added 41424
Authority citation revised ..... † 8800
61.10 Authority citation added 41424
Authority citation revised ..... † 8800
61.12 Authority citation added 41424
Authority citation revised ..... † 8800
61.13 Authority citation added 41424
Authority citation revised ..... † 8800
61.14 Authority citation added 41424
Authority citation revised ..... † 8800
61.15 Authority citation added 41424
Authority citation revised ..... † 8800
61.16 Authority citation added 41424
Authority citation revised ..... † 8800
61.21 (m), (q), and (r) revised ..... † 26373
61.22 (d)(1), (2)(iii), (4)(i) through (iv), and (e) introductory text and (2) introductory text revised; (e)(3) added ..... † 26374
61.24 Authority citation added 41424
Authority citation revised ..... † 8800
61.33 Authority citation added 41424
Authority citation revised ..... † 8800
61.34 Authority citation added 41424
Authority citation revised ..... † 8800
61.43 Authority citation added 41424
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61.44 Authority citation added 41424
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61.53 Authority citation added 41424
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61.54 Authority citation added 41424
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61.55 Authority citation added 41424
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61.67 Authority citation added 41424
Authority citation revised ..... † 8800
61.68 Authority citation added 41424
Authority citation revised ..... † 8800
61.69 Authority citation added 41424
Authority citation revised ..... † 8800
61.70 Authority citation added 41424
Authority citation revised ..... † 8800
61.71 Authority citation added 41424

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61 Appendixes A and B authority citation added..... 41424
Appendixes A and B authority citation revised..... †8800
79.31 (a) revised..... †28490
80.7 (a) and (a)(1) introductory texts and (a)(1)(i) amended; (a)(2) and (c) revised..... 45307
80.23 (b)(2)(iv) amended; (b)(2)(viii) added..... 45307

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53.16 (e) (1) and (2) (iv) amended..... Δ27571
53.30 (a) existing text amended; (a) (1) and (2) added; (b) through (e) revised; eff. 7-30-79..... Δ37916
53.31 (a), (c), and (d)(1) revised; eff. 7-30-79..... Δ37917
53.32 Heading revised; eff. 7-30-79..... Δ37917
53.33 Added; eff. 7-30-79..... Δ37917
55.190 (Subpart I) Added..... 38704
55.230 (Subpart K) Added..... 54248
55.970 (Subpart VV) Added..... 35922
55.971 Added..... 59840
58 Added..... Δ27571
Appendix C amended; eff. 7-30-79..... Δ37918
60.2 (v) revised..... 34347
60.4 (b)(OO) added..... 47692
(b)(SS) added..... Δ7714
(b)(WW)(vi) revised..... Δ23221
60.8 (d) and (f) revised..... Δ33612
60.14 (e)(2) amended..... 34347
60.40—60.46 (Subpart D) Heading revised..... Δ33612
60.40 (e) added..... Δ33612
60.42 Determination..... Δ3491
60.40a—60.49a (Subpart Da) Added..... Δ33612
60.101 (d) and (g) revised..... Δ13481
60.283 (a)(1)(v) added..... 34785
60.300—60.304 (Subpart DD) Added..... 34347

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60 Appendix A amended..... 34785
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61.04 (b)(OO) added..... 47692
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62 Added..... 51393
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65 Added..... 44523
65.51 Table amended..... Δ23833, 23835, 26742
65.90 Table amended..... Δ13489, 16914
65.100 Table amended..... Δ25844
65.101 Table amended..... Δ2388, 17159
65.110 Table amended..... Δ2387
65.111 Table amended..... Δ20080, 27611, 2968, 33683
65.140 Table amended..... 59842, 60462
65.141 Table amended..... Δ37507
65.171 Table amended..... 52704, 60465
65.180 Table amended..... 60464
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65.190 Table amended..... 52707
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65.191 Table amended..... 44844
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65.200 Table amended..... 60161
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65.201 Table amended..... 51782, 51784, 52242, 52243
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65.210 Table amended..... 56226
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65.211 Table amended..... Δ15709
65.220 Table amended..... Δ3287
65.221 Table amended..... 59497-59499
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65.222 Table amended..... Δ27661
65.231 Table amended..... Δ12423
65.240 Table amended..... 47728, 52031, 59500
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65.251 Table amended..... Δ13019 13482, 30338
65.261 Table amended..... Δ15714, 29456
65.300 Table amended..... Δ6912
65.301 Table amended..... Δ15710
65.321 Table amended..... Δ7715, 31180
65.350 Table amended..... 54627
65.380 Table amended..... Δ35225
65.381 Table amended..... Δ23830, 23831, 23834
65.400 Added..... 40015, 40226
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65.401 Table amended.....60462
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65.451 Table amended.....Δ23832
65.471 Table amended....Δ20081, 23833
65.491 Table amended.....Δ32683
65.511 Table amended....Δ13483, 13484
65.521 Table amended.....50681, 50682, 51783
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65.531 Table amended.....Δ13016-13018, 13483, 13485
65.560 Table amended.....Δ8264
80.20 (a)(1)(i) suspended in part 6-8-79 to 10-1-79..... Δ33069

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55.250 (Subpart L) Redesignated from 55.570 (Subpart L)..... 72593
55.350—55.351 (Subpart Q) Redesignated from 55.820—55.821 (Subpart Q)..... 72593
55.370—55.372 (Subpart R) Redesignated from 55.870-55.872 (Subpart R)..... 72593
55.470 (Subpart W) Added..... 67987
55.55.550—55.551 (Subpart AA) Redesignated from 55.1320—55.1321 (Subpart AA).....72593
55.570 (Subpart L) Redesignated as 55.250 (Subpart L)..... 72593
55.710 (Subpart II) Redesignated from 55.1770 (Subpart II)..... 72593

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55.820—55.821 (Subpart Q) Redesignated as 55.350—55.351 (Subpart Q)..... 72593
55.870—55.872 (Subpart R) Redesignated as 55.370—55.372 (Subpart R)..... 72593
55.972 Added..... °41415
55.1320—55.1321 (Subpart AA) Redesignated as 55.550—55.551 (Subpart AA).....72593
55.1770 (Subpart II) Redesignated as 55.710 (Subpart II)... 72593
57 Added; eff. 7-24-80..... °42536
58 Appendixes A, B, D, E, and G corrected (corrections removed at 72589)..... 65066
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60.2 Revised..... 55173
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60.4 (b)(V) revised.....69299
(b)(I) revised..... 70466
(b) (OO) revised..... °3035
60.7 (a)(4) amended..... °5617
60.8 (d) and (f) petition denied.... °8210
60.11 (a) revised..... °23379
60.14 (a) and (e)(4) amended; (d) removed; (g) revised..... °5617
60.16 Added.....49225
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80.304 Heading revised; (f) added 39391

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58.34 Introductory text amended 44164
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